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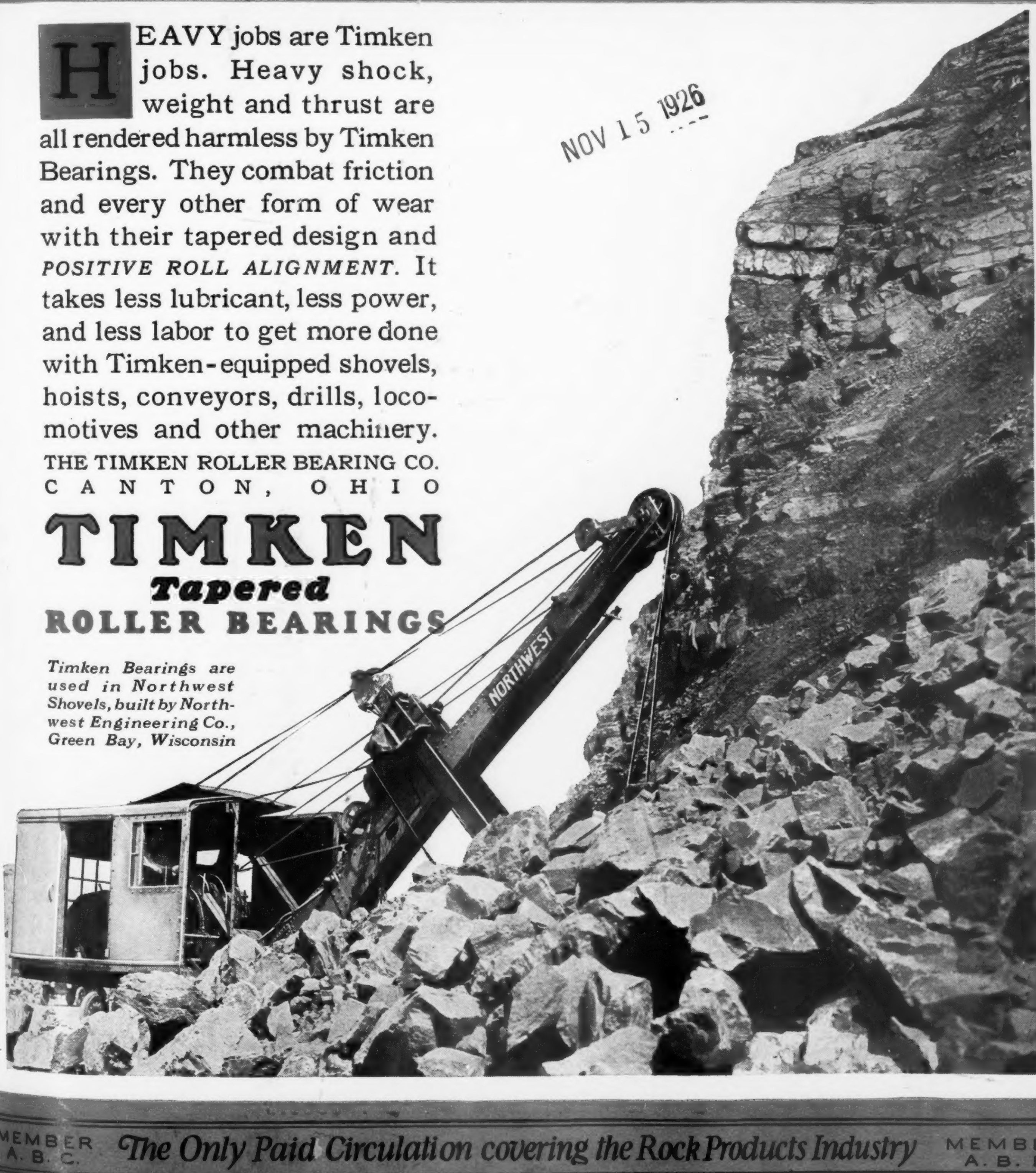

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Rock Products
CEMENT and ENGINEERING NEWS

Volume XXIX | Chicago, November 13, 1926 | Number 23

Welfare Work at Lime and Stone Plant

Miners going to work at the limestone mine of the American Lime and Stone Co., at Bellefonte, Penn.

Welfare Work of the American Lime and Stone Company

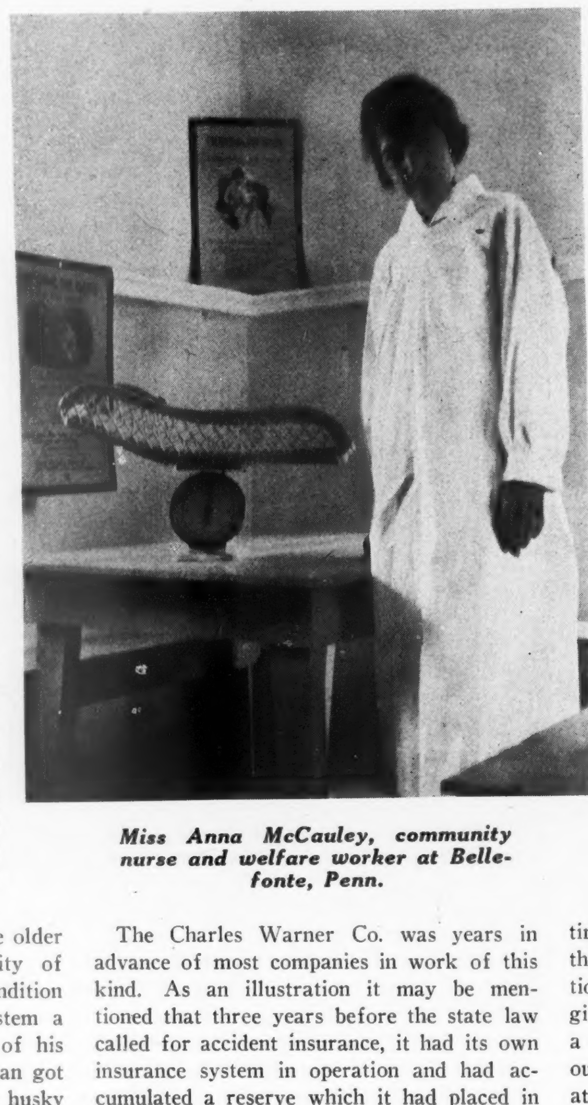
THE plant of the American Lime and Stone Co. at Bellefonte, Penn. (one of the Charles Warner companies) is among the largest in the country in point of production. It is among the few plants that mine limestone in preference to quarrying it, obtaining in that way a cleaner and more uniform raw material. It burns the stone in 18 shaft kilns and two rotary kilns, the latter of which are each 175 ft. long. From its unusual methods and fine equipment it is well known throughout the lime industry of the country.

What is not so well known, perhaps, is the personnel work which is done by this company, the methods employed for the betterment of the employes and the training of the men who have direct charge of the workmen in the various departments. These are the men whom Charles Warner calls "pivot men," and the name is a good one, since the various parts of the enterprise rotate about them, and it is on the steadiness and control they display that the smooth working of the whole organization depends.

During a recent visit of a ROCK PRODUCTS editor to the plant this personnel work was the feature of the operation that impressed him most strongly. It is not that any part of this work is unique or even novel. Other companies do more or less of such work, in and out of the rock products industries. But in this plant it follows very definite and carefully thought out lines. Everyone, from the general manager down, takes a genuine interest in it. Moreover, it can show real and tangible results, which is something that many attempts to do similar work elsewhere have not yet shown.

It is well within the memory of the older leaders in industry that the necessity of training men and bettering their condition became apparent. Under the old system a man was valued mainly on account of his muscle. More than one quarry foreman got his place "because he could lick any husky on the job," and he was apt to value his men by the sizes of stone they could lift into a quarry car. Today such qualities as good judgment, quick thinking and a deep and thorough understanding of one's work are beginning to be placed at their full value. You no longer hear that "men work best when they are fighting mad," for it is appreciated that morale and good team work have a far better effect on production than overstrained individual effort. But these are not to be had from a miscellaneous crew of men thrown together from many sources. Morale and team work are attained through training and cultivation, and self-respect in the workmen and the desire to improve one's self and one's condition have to be brought out by effort on the part of those in charge.

A Leader in Safety and Personnel Work



Miss Anna McCauley, community nurse and welfare worker at Bellefonte, Penn.

The Charles Warner Co. was years in advance of most companies in work of this kind. As an illustration it may be mentioned that three years before the state law called for accident insurance, it had its own insurance system in operation and had accumulated a reserve which it had placed in the hands of a trust company to be used for the sole purpose of compensation.

The first thing that impresses one in studying this personnel work is that it goes all through the organization. Charles Warner personally signs the letters that are sent to the pivot men every two weeks. Samuel Shallcross, general manager, "sits in" with the pivot men at their meetings the same as any department head. Walter R. Cliff, the general superintendent, is thoroughly versed in what is coming to be called "humanics" and counts the morale of the workers the greatest asset that a plant can have. And it is to be noted that no part of the work can be considered as "coddling" the men or exerting a "beneficient paternalism."

The work divides itself into three branches, which are safety work, training of pivot men, and clinical work. Safety work, of course, has long since proved itself able to pay dividends, if one wishes to look at it from a cold-blooded business viewpoint. Training of pivot men in a systematic way is newer, but it, too, is showing results. And clinical work to insure the health of the men and their families is only the logical extension of the safety movement, and at this plant it is put on a proper business basis. General clinical work, through which all benefit, is paid for by the company. Individuals who receive particular benefits from clinical work pay for it at a reasonable price.

Safety Methods

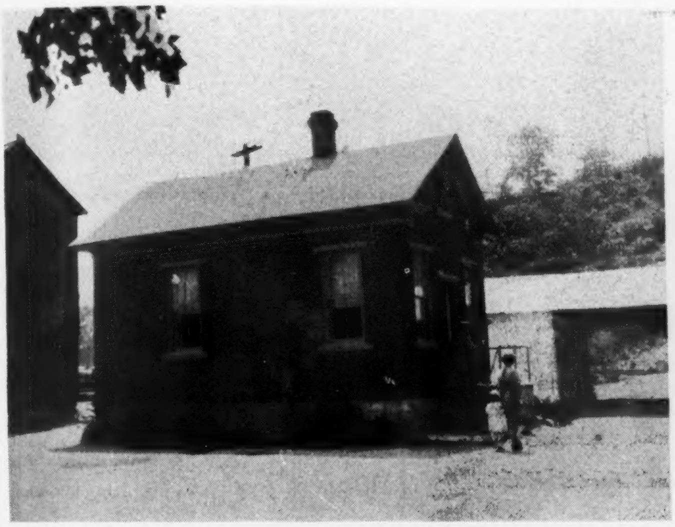
Each of the above mentioned branches has its own organization. Safety work is in charge of Arthur Hewitt, chief engnieer. He heads a committee which includes James McNichols, superintendent; Solomon Koski, mine captain; Frederick Daggett, chief electrician; Daniel Gordon, foreman of the lime shipping department, and C. E. Dorr, the foreman of the crushing plant at Union Furnace. The committee as a body makes regular visits of inspection through the entire plant and the mine, reports on what it finds and makes suggestions for improving conditions. It sees that such things as safety cabinets and fire extinguishers are in their proper places and that the men know where they are. Suggestions considered worth following up are given a number and placed in a book, and a record of the progress in carrying them out is kept. Reports of accidents are read at the meetings of the pivot men, the accidents are discussed and measures proposed to obviate such accidents in the future.

Studying the Accident Record

At a meeting which the writer attended the accidents which had occurred since the beginning of the year were studied and it was found that the minor accidents were mainly due to cinders or steel getting into

the eye and to stepping on nails. The remedy for the first class of accidents was obviously to insist on a more general wearing of goggles in some kinds of work; and for the second class to see that boards with nails in them were not left lying about. It was shown that some of the nail accidents probably would not have happened if the men had worn well soled shoes, which any man earning present-day wages is well able to do. It is only through carelessness that men neglect to have worn shoes soled.

At the time the notes were being taken record of accidents displayed, and ROCK PRODUCTS has published pictures of these at other plants. The board shown in the illustration is one of the most striking of such records that has appeared, and it is placed in such a prominent position that everyone approaching the plant has to see it. So long as the row of little men above the board is unbroken there is a feeling of satisfaction in the mind of everyone who passes. But let a man go down and the news runs through the plant quickly and everyone wishes to know what has happened. A very Labor and Industry, which makes the usual regular inspections and adds suggestions. This department has very advanced ideas in Pennsylvania, since so much safety work has been done in connection with coal mining. However, limestone mines have been given a separate classification in the state, so the provisions of safety for coal mines and metal mines do not apply. It is not necessary for a limestone mine to maintain the expensive ventilating system required in a coal mine on account of gas. Natural draft ventilation in the Bellefonte mine is



House where the weekly baby clinic is held

Dr. Dale examining a baby at the clinic

Children waiting at door of clinic

Mothers and babies at the clinic

for this article a regular safety campaign was in progress. The mine of the American Lime and Stone Co. already has a high reputation for its safety provisions, and it received honorable mention in the National Safety Award contest. It is now the ambition of all to bring the safety conditions of the entire operation to the same high level or to surpass it if possible.

It is not unusual to have some easily seen minor accident put a man down while the writer was visiting the plant, and it was noted how quickly the news spread and how much it was regretted that the line was broken.

Co-operating With the State Departments

Of course all safety work is correlated with the work of the State Department of

excellent and there is no danger from powder fumes, as all the holes are shot at 4:00 p. m., when the day shift goes off, and the night men do not enter the mine until 7:00 p. m. This gives ample time for the air to clear.

The work with gas masks and oxygen helmets is not needed for safety men in a limestone mine, so no training in such work is given at Bellefonte. However, ad-

Miners preparing to enter limestone mine

Cage of miners descending into limestone mine

vantage was taken of a visit of the Bureau of Mines safety car to train the safety men in applying artificial respiration, as this is needed in certain cases, as asphyxiation or drowning, and electric shocks, such as may occur anywhere and even when a man is off on a vacation trip.

Training Pivot Men

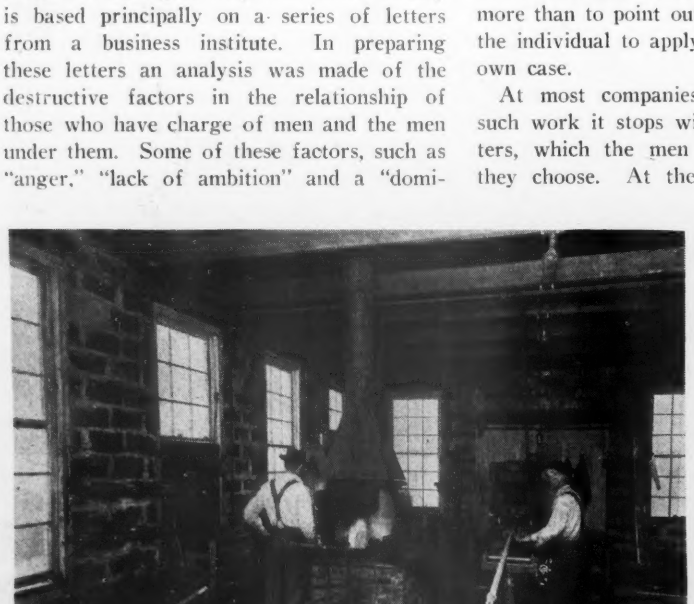
The work of training the pivot men is given to all those who have charge of other men and to younger men who have shown some fitness for holding pivotal positions. It is an excellent thing for these young men, not only because it encourages their ambition and self-respect, but because it helps them to form a philosophy of life, without which no man gets very far. The training is based principally on a series of letters from a business institute. In preparing these letters an analysis was made of the destructive factors in the relationship of those who have charge of men and the men under them. Some of these factors, such as "anger," "lack of ambition" and a "domineering nature," are obvious enough, but others, such as "lack of brevity," "lack of reserve," and "favoritism," are not so obvious, although they are just as destructive in their results. Over 200 of these letters are sent to home addresses of men in the Charles Warner companies each month, and Mr. Warner signs each one personally.

A Course to Cure Bad Mental Habits

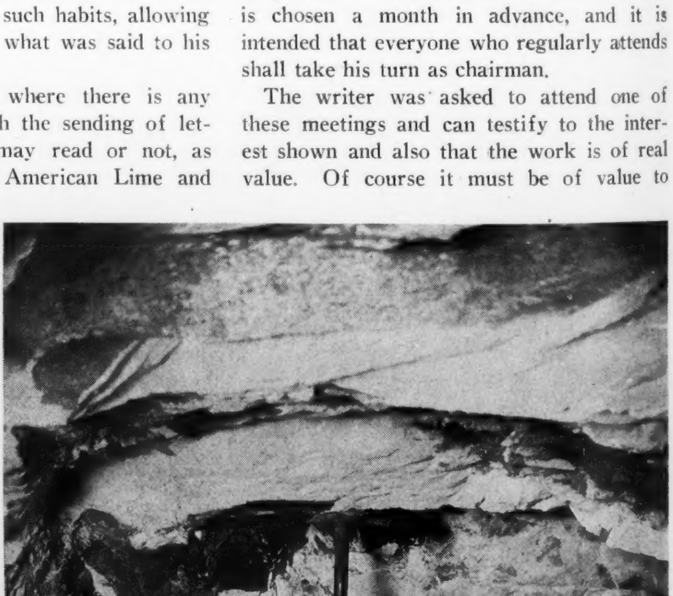
It is the fashion of the day to sneer at such courses and to point out that human relationships cannot be reduced to a formula. But bad mental habits may be cured, and they usually are cured once a man is convinced that he has them. So far as the letters which were read by the writer are concerned, their purpose seemed to be no more than to point out such habits, allowing the individual to apply what was said to his own case.

At most companies where there is any such work it stops with the sending of letters, which the men may read or not, as they choose. At the American Lime and Stone Co. the work goes a step further. The men who receive them hold fortnightly meetings at which the letters are read aloud by the chairman and then discussed if anyone wishes to discuss them. Expression of individual opinion is encouraged and explanation is forthcoming where it is needed. But this is only a part of the work at such meetings. Often provision is made for someone to address the men on some subject which is of importance to their work. At one meeting the heat treating of steel was discussed by Prof. Knight of Penn State College. At another a du Pont representative talked on the uses of explosives. At such meetings all the men who would be interested in the particular subject to be discussed are invited to be present. The chairman for each meeting is chosen a month in advance, and it is intended that everyone who regularly attends shall take his turn as chairman.

The writer was asked to attend one of these meetings and can testify to the interest shown and also that the work is of real value. Of course it must be of value to



Blacksmith shop of the company at Bellefonte



Mine heading in Bellefonte limestone

have such matters discussed from the standpoint of experience and to have right and wrong ways of dealing with men so clearly pointed out. It has been the writer's observation that most men of promise who fail do so for lack of training and experience in dealing with other men. No matter how well equipped a man may be in the theory and technique of his profession, without the knowledge of "how to get along with people," he does not go far. Such courses as the pivot men receive in the Charles Warner companies might well be made a part of an engineering school or college curriculum.

Welfare and Clinical Work

So many well-intentioned efforts in welfare and clinical work have failed that it is pleasant to record that such work is meeting with success in the American Lime and Stone Co.'s operation. Possibly one reason for this is that it is put on a business basis so far as possible. Miss Anna McCauley, who is the community nurse for Bellefonte, is in charge and gives one full day each week regularly, with such other time as may be needed. If a man is reported sick or has been so seriously injured as to require nursing, she goes to his home and sees that there is someone in the family who understands what needs to be done and how to do it. If she has to do a nurse's work or to give instruction, so that some member of the family may do such work, it is expected that the recipient of the service will pay for it at the rate she charges the company. This is only fair and it makes such service a business proposition instead of charity.

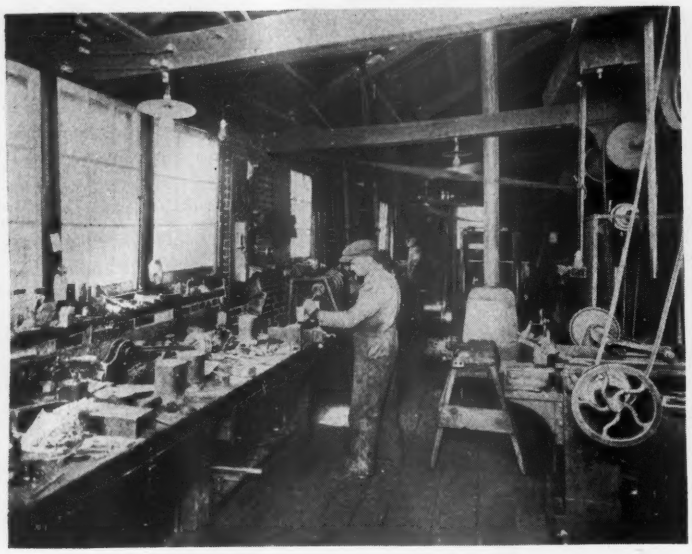
Samuel M. Shallcross, general manager, American Lime and Stone Co.

Baby clinics are conducted by Dr. David Dale of Bellefonte, who gives his services in the self-sacrificing way that marks the medical profession everywhere. Children from infancy to school age are admitted and are regularly weighed, measured and given a thorough physical examination. Diets are prescribed and if special medical or surgical attention is needed for a child its parents are advised to consult their own physician.

It was pleasant to learn from Miss McCauley that the children of this locality grade very well. There are few cases of underweight or of those who show undernourishment. Of course such a place as Bellefonte has many advantages for raising children over the ordinary city industrial neighborhood. These are pure air, plenty of sunlight, freedom from flies and mosquities, and plenty of lime in the soil. Perhaps a diet higher than ordinary in calcium is the main factor. In a few cases of undernourishment the trouble has been traced to such things as giving strong coffee to young children, the use of too much canned milk, especially without diluting it, sleeping in hot, closed rooms, and improper personal habits. Improvement has always resulted when these things were corrected.

As to housing and sanitation, it may be

General office of the American Lime and Stone Co., Bellefonte, Penn.



Machine shop of the company at Bellefonte

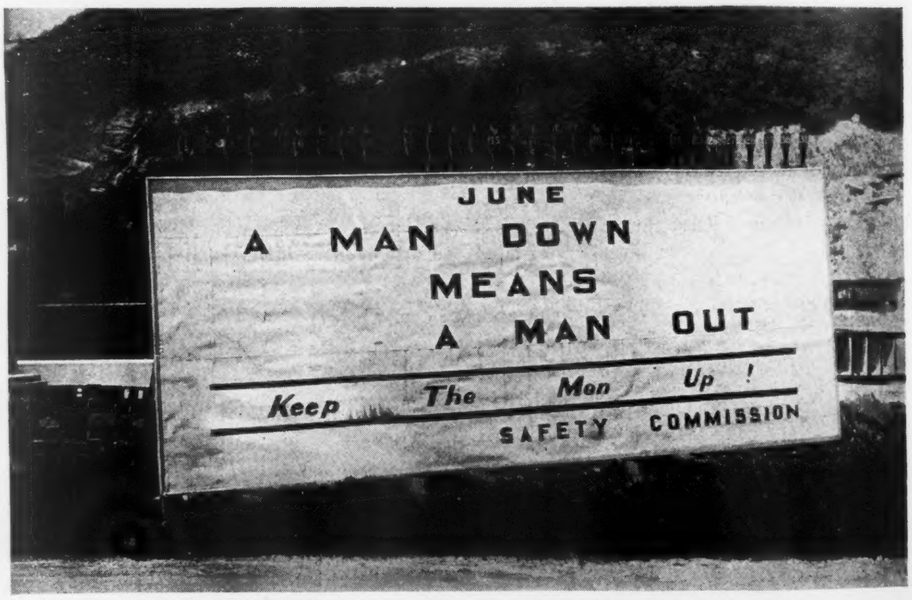
One of the locker rooms for miners

pointed out that the company's village at Union Furnace, where it produces crushed stone and flux stone, is considered something of a model in this regard. It is on a state highway, and highway officials have commended it for the neat appearance of the yards and for the vegetable and flower gardens. This is all the work of the men and their families, although the company stimulates it by offering small prizes for such things as the best vegetable garden and the best looking flower bed. These prizes are awarded monthly.

At Bellefonte the company has had to fight one serious epidemic of typhoid. Fortunately, all cases were taken in time and, although an improvised hospital was filled with patients, no deaths resulted. The cause was traced to an old local water supply. This was destroyed and the houses were connected with the city water mains and there has been no recurrence of the infection.

Group Insurance

Everyone who works for this company is



The board that keeps the accident record before the men

Drafting room at Bellefonte

Laboratory at Bellefonte

insured under a group plan. The benefits run from $500 to $1500, according to the time that the man has been with the company, the increase being at the rate of $100 a year until $1500 is reach. This insurance covers everyone, including office employes and heads of departments.

Why Personnel Work Is So Successful

One of the reasons why personnel work has proven so successful at this particular plant is to be found in the appreciation of its importance by the management. Samuel Shallcross, the general manager, is an industrial engineer who has had experience in several industries and who has been successful in lowering costs and increasing output in them. In such work organization, training of personnel and safety and welfare work proved themselves of the greatest importance in obtaining the improved results. It was natural that he should apply his experience in his management of the Bellefonte works.

Mrs. Shallcross is a professionally trained welfare worker and has been interested from the first in the clinic and in welfare problems. She often attends the baby clinics and has helped a great deal in putting welfare work on a sound basis.

The officers of the company are: Charles Warner, president; A. D. Warner, Jr., vice-president; J. K. McLanahan, Jr., vice-president; C. C. Bye, secretary; Samuel M. Shallcross, vice-president and general manager; G. C. Bingaman, treasurer; A. M. Barr, assistant secretary; Isabel Nevling, assistant treasurer.

Canadian Asbestos Industry in 1925

THE Sherbrooke district in the Province of Quebec supplies more than 80% of the total world production of unmanufactured asbestos. Most of it is imported by the United States for use in a number of the more important American industries.

The 1925 production—273,522 short tons, valued at $8,976,645—showed an increase of 31% in tonnage and 37% in value compared with 1924. An average price of $32.82 per ton in 1925 and $31.37 in 1924 was indicated, although the average for the fine grades of crude asbestos was lower in 1925 than in 1924. The increased valuation is attributable to a further standardization of grades needed for specifiic industries, which enabled producers to obtain a better price for certain short-fiber grades extracted at the mills.

The extraction of ore for 1925 was very satisfactory. It amounted to 129.7 lb. of asbestos fiber per ton of rock mined, compared with 124 lb. per ton in 1924 and 117 in 1923. The increased extraction is said to have resulted from improved machinery and methods of handling the ore.

Total shipments in 1925 amounted to 258,017 tons, valued at $9,682,392, compared with 204,749 tons, valued at $7,734,859, in 1924. Exports to the United States amounted to 209,879 tons, valued at $6,469,644, in 1925, and 161,815 tons, valued at $5,027,392, in 1924. The next largest shipments in 1925 were 11,000 tons to Germany, 8700 to Great Britain and 6000 to Belgium.

The most important development during 1925 was the merger of 11 Canadian-owned asbestos-mining enterprises under the title of the Asbestos Corp., Ltd., which will have an output well over a third of the total Canadian production. The prosperity of the Canadian asbestos industry has never been stable, because the abundance of ore bodies available and the lack of co-operation have brought about overproduction when prices were good, except during and immediately following the war, when the demand was abnormally large. With the establishment of the corporation it is hoped to produce a situation that will limit production to the reasonable demands of the market. [The financial details of this merger have been published in ROCK PRODUCTS.—Ed.]

The greater volume of production in 1925, and the reduction of costs by means of improved methods of milling and grading, made it a satisfactory year for the industry. The quantity formed a new record, and its value has been exceeded only in 1919 and 1920, when prices were unusually high owing to post-war economic conditions. Heavy purchases in the United States continued through the early months of 1926, and declared exports to this country from the Sherbrooke district were greater during the first half of the current year than for the corresponding period of 1925—increasing over this period from 87,676 tons, valued at $2,857,270, to 104,248 tons, valued at $3,457,841. The demand in Europe is good, and although shipments to the United States have slackened somewhat in the last two or three months, there is a tendency to expect a prosperous year in the industry in 1926.—Consul C. B. Hosmer in *U. S. Commerce Reports.*

General view of plant of American Lime and Stone Co. at Bellefonte. Insert shows the safety committee

Greenville Gravel Corporation's New Plant

Installation at Columbus, Ohio, of Large Dredge with Washing, Screening and Crushing Equipment

THE Columbus plant of the Greenville Gravel Corp. of Greenville, Ohio, is the latest plant to be built by the company that is probably the largest producer of sand and gravel in the United States. It follows somewhat the lines of other plants built by the Greenville company, notably the plant at Urbana, Ohio, where the conditions are somewhat similar. Nevertheless it has some features peculiar to its own design which make it one of the most notable plants erected in 1926.

One of the remarkable things about this operation is the number of products made. The company issues a neat little pamphlet describing these. There are three kinds of sand and 12 kinds of gravel and gravel and sand mixtures, three crushed gravel products and three classifications of railway ballast and several mixtures of crushed and uncrushed material listed.

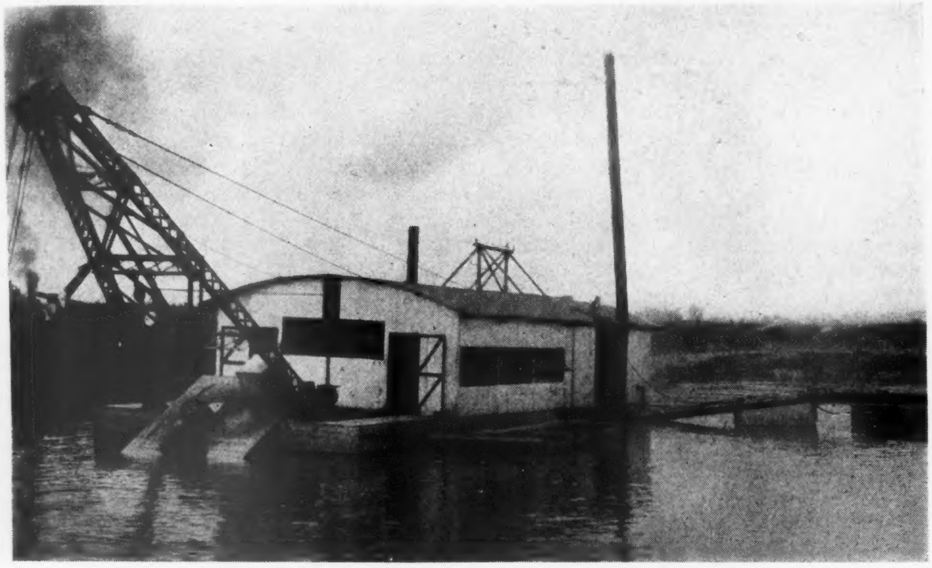
So many products would ordinarily call for a somewhat complicated flow sheet, but the flow sheet of this plant is not at all complicated. The number of products is obtained by the simplest means and with no rehandling. There is only one elevator in the plant (except for a short elevator that lifts to a bin) and that is necessary in almost every plant where there are crushers, as it lifts the discharge from the crushers to a screen.

This is a dredging operation, one of five which the company operates. The gravel is dug by a 15-in. Amsco pump mounted on a hull and direct-connected to a 400-hp. General Electric motor of the slip-ring induction type. The hull carries the transformers which take current at 2200 volts on the high side and deliver it at 490 volts.

The dredge is fitted with a rotary manganese steel head cutter which is suspended from a 50-ft. ladder and driven by a 25-hp. motor. It makes 8 r.p.m. For holding the dredge in position there are two spuds made of 16-in. pipes. For moving the dredge there is a power winch with a 25-hp. motor and a centrifugal pump with a 10-hp. motor which serves as a bilge pump.

The dredge is connected to a line that is now only about 400 ft. long and which pumps to a dewatering sump on the shore, the discharge being only a few feet above the water level. Under such conditions the dredge has a very large capacity, as so little power is lost in friction head and high lift.

The dewatering sump is perhaps the most ingenious method of the many that have been devised for getting rid of the water that accompanies sand and gravel when it is dug up by a pump dredge. Many ways of doing this have been devised. The simplest, and perhaps the most used, is to discharge the pump on a screen which is usually of the gravity type, but this means that the pump must lift to the top of the plant, which requires considerable power. A method now becoming more and more popular is to pump to a tank or sump, provided with an overflow, and exca-



Dredge with 15-in. pump and rotary cutter

Discharge of dredge to sump

Excess water overflowing at sump

All steel plant of the Greenville Gravel Corp., Columbus, Ohio. The dewatering sump at left does not show in the picture

vate the gravel and elevate it to the top of the plant by an elevator provided with buckets that will dig through the settled material. This has the disadvantages incident to elevators in general. A third well-known method is to pump to a place in front of the plant and then excavate and lift the material with a cableway dragline bucket. All of these work well, but the method adopted by the Greenville Gravel Co. departs widely from any of these.

The pump discharge falls into a sump, provided with an overflow, which is built over a concrete tunnel. Skips are let down into this tunnel and filled from gates in the roof. Of course some water, which filters through the sand and gravel, goes into the car, but that is of no moment, as water would be added anyway at the screens above.

This method of dewatering the dredge discharge was devised by F. D. Coppock, the president of the Greenville Gravel Corp. It has been used in several of the company's operations and has proven so satisfactory that it has been adopted as their standard practice where dredges are used. At least one other large producer is considering changing to this method.

The sump is somewhat oval in shape, about 60 ft. the long way and 40 ft. the short way. The overflow is on one side and is about 30 ft. wide. This overflow does some classifying, removing the unwanted fine sand. If it were desired to save this sand it could be done by increasing the length of the overflow. This would lessen the "velocity of approach" as the water flowed from the pump discharge to the overflow and allow time for the finer grains of sand to settle before the overflow was reached.

The tunnel under the sump is solidly built, the great weight being carried on struts of structural steel. It runs underground about 40 ft. and has the same pitch as the skipway, which is 38 deg. The tunnel is high and light so that one may walk comfortably down under the sump without realizing he is going below the level of the pond. The tunnel is kept dry by a small pump and motor.

The skipway is solidly built of structural steel on concrete foundations. Beside the two tracks for the skip there is a walkway and hand rail affording easy access to the upper part of the plant.

The skips hold 3½ tons each, but preparations were being made when the plant was visited to change them for skips of greater capacity so as to increase the output of the plant. Each skip is raised and lowered by a drum on a 100-hp. Lidgerwood hoist, the rope lengths being so arranged that when one skip is dumped the other is under the gate in the tunnel. These gates were being worked by hand when the plant was visited, but the equipment to change to working them by compressed air was already on the ground. At the other plants of this company where this system is in use the gates are worked by compressed air.

A certain amount of material is recovered by steam shovels which are ordinarily engaged in stripping. This is brought in over a track beside the sump and dumped on a grizzly of rails set 8 in. apart. It is then taken out of the gates and hoisted by the skips along with the material discharged from the pump.

The skips discharge into a receiving hopper which holds about 25 tons. From this it is fed to the two main washing screens, which are 21 ft. 9 in. long and of which the main section is 60 in. in diameter. The first 2 ft. of each is blank. Each screen has three jackets, including the main section. This is perforated with 1¾-in. holes on one screen and 1-in. holes on the other. The second jacket on both has ⅝-in. holes, and the third, the outer jacket, has ¾x¼-in. slots. The undersize of this outer jacket is divided between a sand screen and the sand boxes. The intermediate sizes of this

screen go to bins.

The sand screen is 17 ft. 3 in. long and of 48-in. diameter for the main section. This is perforated with large holes, and a second jacket is perforated with ⅛-in. holes. The outer jacket has 1/12-in. holes. The purpose of the large holes in the main section is is spread the material over the next jacket so as to avoid undue wear at one point and to give a greater screening capacity. The undersize of the outer jacket goes to sand recovery boxes.

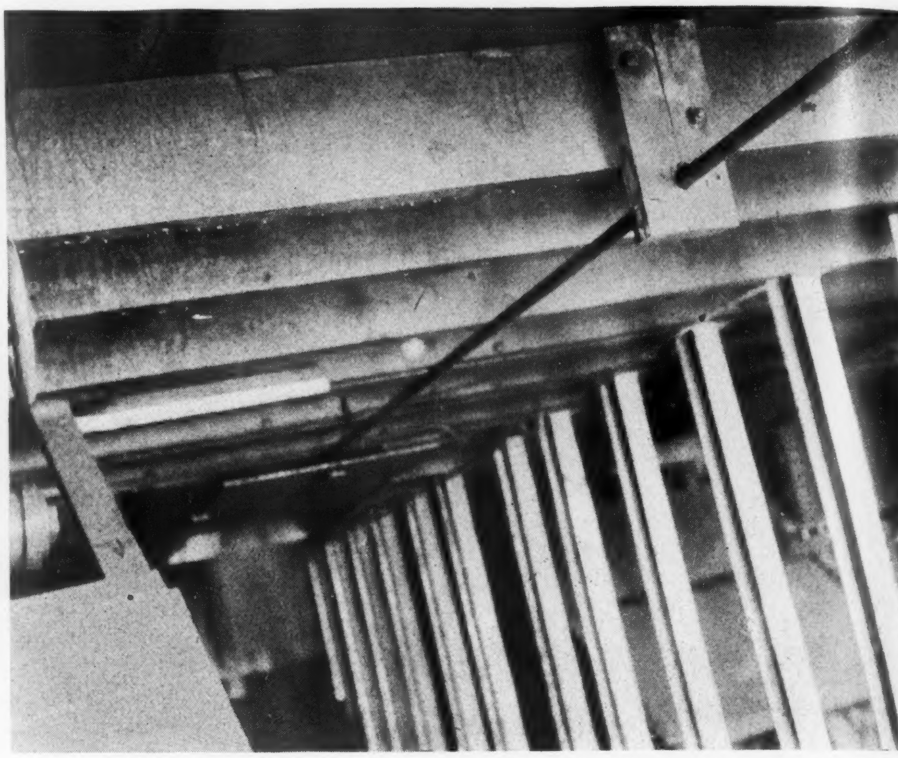
There are thus four sand products, that which is made by the ¾x¼-in. slot on the main screen, and the stone screen; the oversize of the sand screen, which is the first mentioned product after passing a ⅛-in. screen; a size between, ⅛-in. and 1/12-in.; and the undersize of the 1/12-in. screen. These may be combined by means of chutes to make any combination desired. In this way orders may be filled from "prescriptions" calling for certain mixtures of sizes or for a definite fineness modulus.

The crushing department which receives the oversize of the main washing screens has three crushers, a No. 6-N Gates type and a No. 5 McCully Superior (both made by Allis-Chalmers) and a No. 4 cone type Symons crusher. This last is a comparatively new machine. It resembles somewhat the Symons vertical disk crushers, but in the place of disks there is a cone below and a hollow cone above. This crusher is very efficient in its particular field (the smaller sizes) according to the experience obtained at this plant.

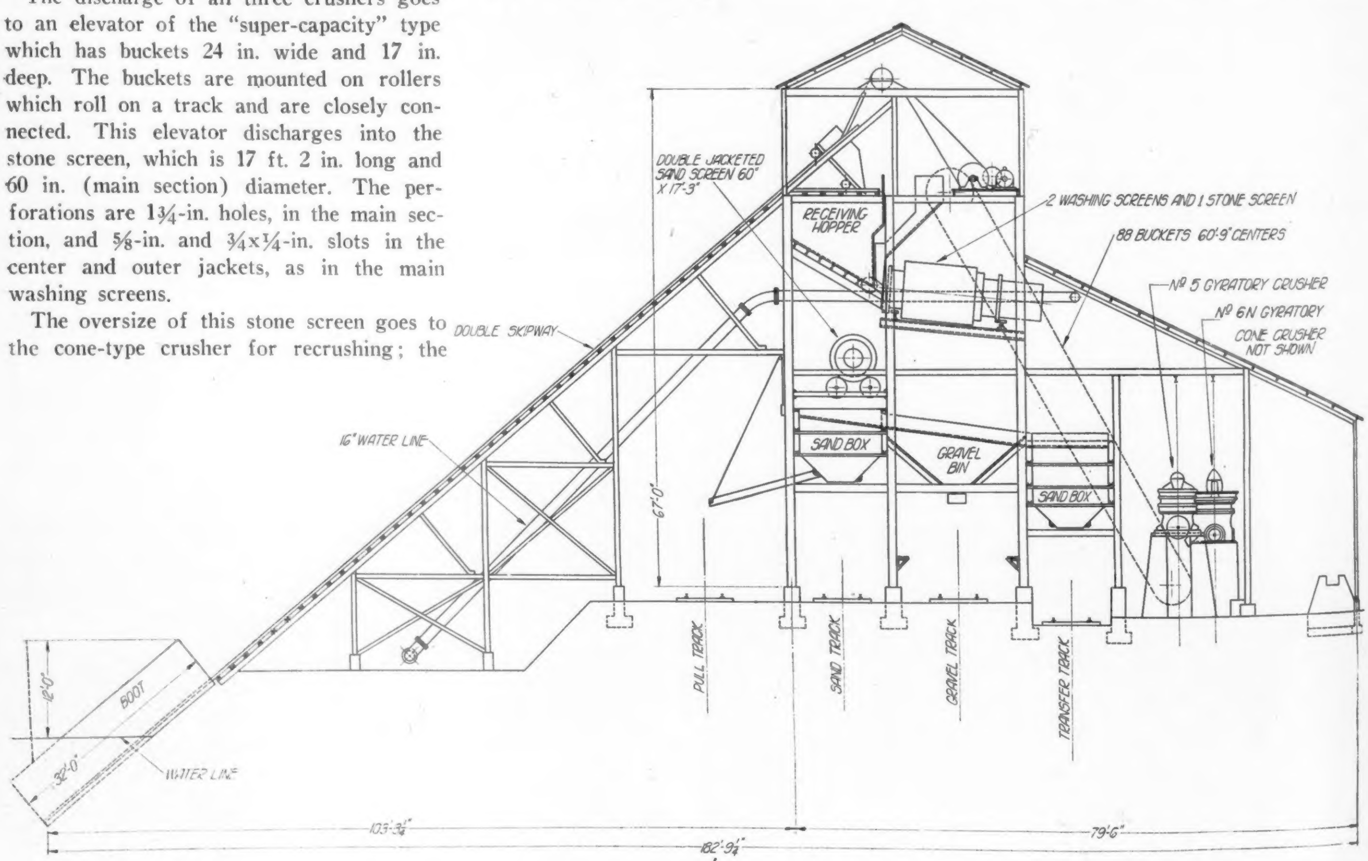
The discharge of all three crushers goes to an elevator of the "super-capacity" type which has buckets 24 in. wide and 17 in. deep. The buckets are mounted on rollers which roll on a track and are closely connected. This elevator discharges into the stone screen, which is 17 ft. 2 in. long and 60 in. (main section) diameter. The perforations are 1¾-in. holes, in the main section, and ⅝-in. and ¾x¼-in. slots in the center and outer jackets, as in the main washing screens.

The oversize of this stone screen goes to the cone-type crusher for recrushing; the other sizes are sent to bins, with the exception of the undersize of the ¾x¼-in. slot, which is sent to sand recovery.

Water for washing comes from two 8-in. De Laval centrifugal pumps, each of which is direct-connected to a 60-hp. motor. Both pumps discharge into a 16-in. pipe. The use of so large a pipe permits either or both pumps to be run at the same time. At the screens the water is divided among 6-in. pipes which run through the screens and which are perforated to allow a number of streams to play on the material. The screens are all of the full tire-and-trunnion type



Looking down into tunnel under sump showing gate through which skips are filled



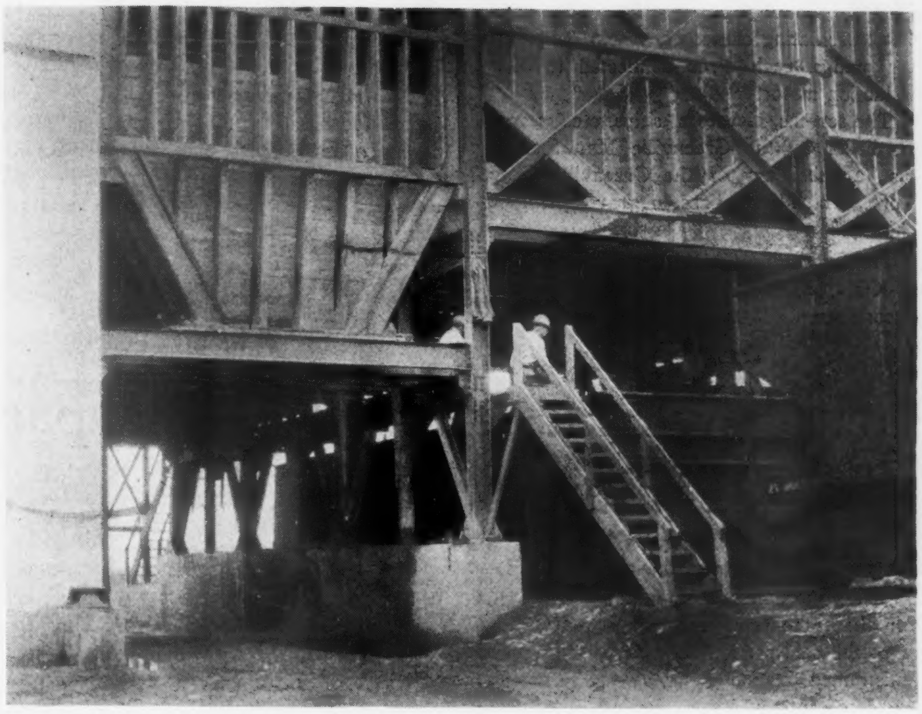
Longitudinal section through plant and skipway

which has been so highly developed by the engineering department of the Greenville company. They allow a center washing pipe to be run through the screen and supported at both ends, and at the some time have ample room for the heaviest feed to pass.

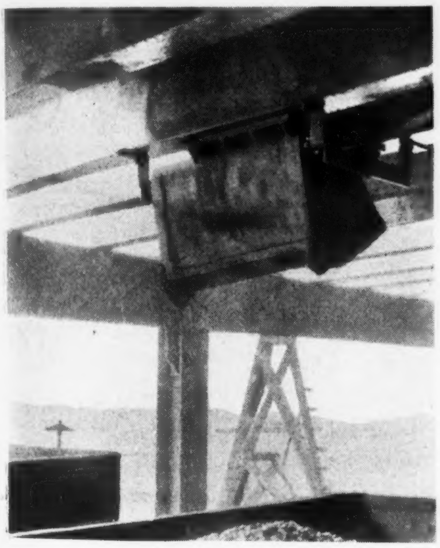
The sand boxes are simple settling boxes with hand-operated valves, the sand going directly to the cars that are to be loaded.

One of the features of this plant that will first attract the attention of those familiar with sand and gravel operations is the small bin capacity. The bins in fact are little more than hoppers designed to allow the changing of cars without spill. Storage is provided for by using a space near the plant to which loaded cars are run and discharged, the material afterward being piled by a locomotive crane.

Ample trackage has been installed above and below the plant. Two lines of track pass under the bins and two to four cars are always loading when the plant is running. Cars can be run through the plant by gravity from the empty car storage to the filled car storage.



Bins and sand boxes over loading tracks



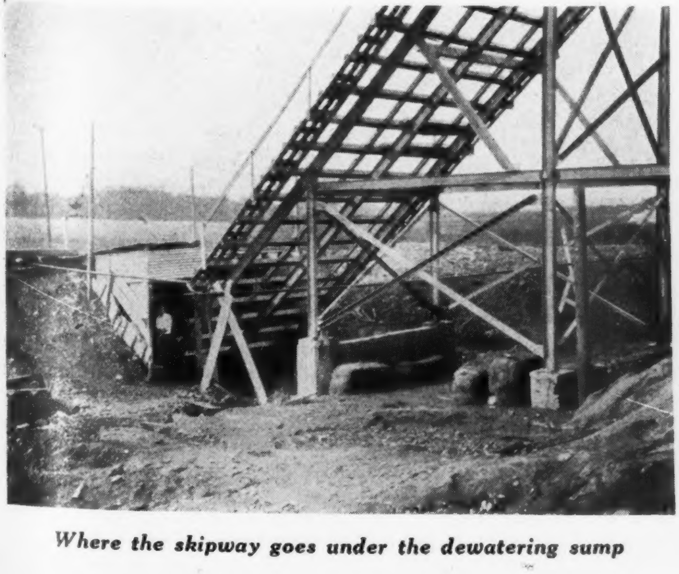
Swinging spout for spreading gravel in car

The cars are loaded through an oscillating chute, devised by Mr. Coppock. There are two of these over each track driven by a crank and rod. As the gravel falls through them these chutes move back and forth spreading the material. This avoids segregations and makes the load uniform in character throughout.

The output of the plant at the time it was visited to obtain the notes for this story was 75 cars per day. As many cars of more than 100,000-lb. capacity are often loaded, the capacity in tons at this time was in excess of 4000 tons per day. But arrangements had already been made to increase the production to 100 cars per day, or something over 5000 tons.

The plant is splendidly constructed of steel and concrete throughout, except for the bins above the cars. This excellent construction is a feature of all the Greenville Gravel Co.'s plants, not only those which it has built for itself, but those which it has built for other sand and gravel companies through its engineering department. The design is due to Frank Welch, chief engineer of the company, who has designed so many of the larger plants of this country.

General Electric motors are in use throughout. A list of these with horsepower and type of each is: Dredge pump, 400-hp. slip ring; cutter, 25-hp. induction; winch, 25-hp. induction; bilge pump, 10-hp. induction; skip hoist, 100-hp. slip ring; main washing screens and sand screen and stone screen, individual drives with 25-hp. squirrel cage motors; two gyratory crushers belt driven from 100-hp. squirrel cage motor; cone crusher, 70-hp. slip ring; elevator, 25-hp. squirrel cage; pebble elevator to bins,



Where the skipway goes under the dewatering sump

Pump house with two 8-in. pumps delivering to 16-in. line

10-hp. induction; machine shop, 5-hp. induction; oscillating chutes under bin, 2-hp.; water pumps, each direct-connected to 60-hp. induction motor.

The screens, elevators, skips, etc., were all furnished by the Greenville Manufacturing Co., a subsidiary of the Greenville Gravel Corp., which specializes in gravel plant machinery.

The Greenville Gravel Corp. has 12 plants in Ohio, Michigan and Indiana and produces from 6,000,000 to 7,000,000 tons yearly. This year the production will come close to the 7,000,000 mark, according to the production achieved at the time this was written.

The main office of the company is in Greenville, Ohio. F. D. Coppock is president of the company, Guy C. Baker is vice president, and H. R. Brown is secretary and treasurer. C. E. Patty is general manager and Joseph F. Coppock, assistant general manager. The Columbus plant is in charge of P. S. Klyne, division engineer. John J. Corcoran is assistant manager.

Grinding Practice at Four Feldspar Plants of Tennessee*

IN the United States, during the last few years, there has been mined and ground for the trade from 150,000 to 160,000 tons of potash feldspar annually. Although found and mined in many places, one principal source of supply is the counties of Mitchell, Avery, and Yancey, along the western border of North Carolina. There the mineral occurs in great quantities in a pegmatite

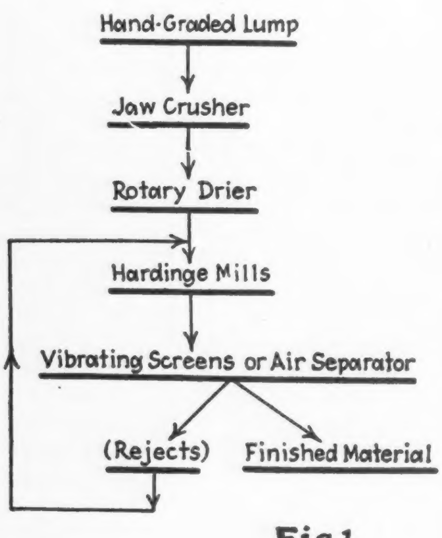


Fig.1

Continuous process of grinding with rejects from air separator returned to mill

dike. It is mostly hand-picked as it is loaded into railroad cars for shipment about fifty miles to Erwin, in Tennessee. At Erwin are three grinding plants, and at Bristol, in the same state, there is one plant. These two growing industrial centers of eastern Tennessee possess excellent railroad facilities as well as abundant supplies of water and electric power—three essential factors necessary to the establishment of any industry. To the district is to be credited about one-third of the supply of ground feldspar produced annually in the United States.

As shipped to the grinding plants, the feldspar is in crystalline lumps of from 3 to 4 in. in diameter up to as large as a man can handle. Before grinding the lump rock is carefully hand-picked to remove quartz or other impurities.

The four plants mentioned use the same general methods of procedure in reducing the mineral to the required degree of fineness; namely, jaw crushers for preliminary crushing; then Hardinge mills, which were in some cases followed by tube mills. However, slight differences in detail and in machinery used may be noticed. All the grinding is conducted dry. As these plants are strategically located where hydro-electric power is abundant, the motive power used is electric.

The principal difference in the plants in regard to operation is the procedure for fine grinding. This divides them into two classes: (A) Those that have a continuous fine-grinding process, and (B) those that "batch grind" for the fine grinding. The accompanying flow sheets are typical of these.

The lump rock is first passed through jaw crushers. One plant uses two jaw crushers, the first crushing the lumps to about 4-in. size, the stone going from there either to storage, for later reclamation, or to the second jaw crusher, where it is crushed to about ½-in. size. In another plant, the material from the jaw crusher is passed between rolls, so set that sizes of ⅝ in. and finer are obtained. After this preliminary crushing, the material is passed through the drier, where traces of moisture are removed, a procedure necessary for fine grinding. The drying mechanism is a direct-heating rotary drier of the usual type, the source of heat being an oven or furnace built at one end, and using coal and coke for fuel.

In some plants, the raw material is elevated to the jaw crushers, which are placed at the high point of the mill, and the crushed rock conveyed through the processes mostly by gravity. This is usually done where the plant is located on the side of a hill.

Batch or Continuous Processes

The dry mineral, reduced to about ½-in. size and finer, is next passed through the Hardinge mills. These mills are in use at all the plants. They are usually fitted with link-belt type drive. From this point on, the process varies according to whether or not the method used for fine-grinding is continuous.

If the continuous process is used, the material from the Hardinge mill passes either to vibrating screens or to an air separator (of the Emerick or centrifugal type), and the oversize is returned to the feed end of the Hardinge mill, to again go through the cycle of grinding and separation.

If the batch-grinding process is used, the rejects from the vibrating screens or air

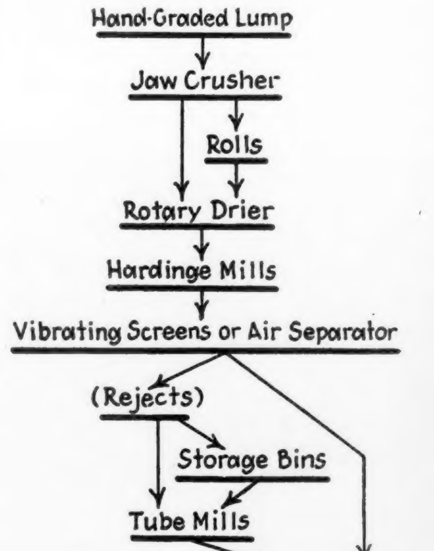


Fig.2

Batch grinding with air separator rejects treated in a separate mill

separator, as the case may be, are transferred either to storage bins for later grinding, or directly to the tube mills, where the material is reduced to the desired degree of fineness. In one case, vibrating screens in place of an air separator and two tube mills of the standard type, 6 by 24 ft., are used.

Ground feldspar is supplied to the trade in three degrees of fineness, these being 80 to 100-mesh, 140-mesh, and 200-mesh sizes. The glass manufacturers use the coarser sizes, 140 mesh is used in enamels, and the pottery trade requires the 200-mesh size. Though the several feldspar mills vary somewhat in size, the number of men employed at each one varies from eight to twenty, and the average capacity output of ground feldspar per plant is from 1500 to 3600 tons per month.

The four companies operating grinding plants in Tennessee are: Erwin Feldspar Co., Golding Sons Co., and Clinchfield Products Corp., all of Erwin, and the Tennessee Mineral Products Co., of Bristol.

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*Abstracted from *Engineering and Mining Journal*, 122, 18, 692.

Modern Methods and Processes of Mining and Refining Gypsum*

Part XIII.—Gypsum Plaster Board and Wall Board

By Alva Warren Tyler

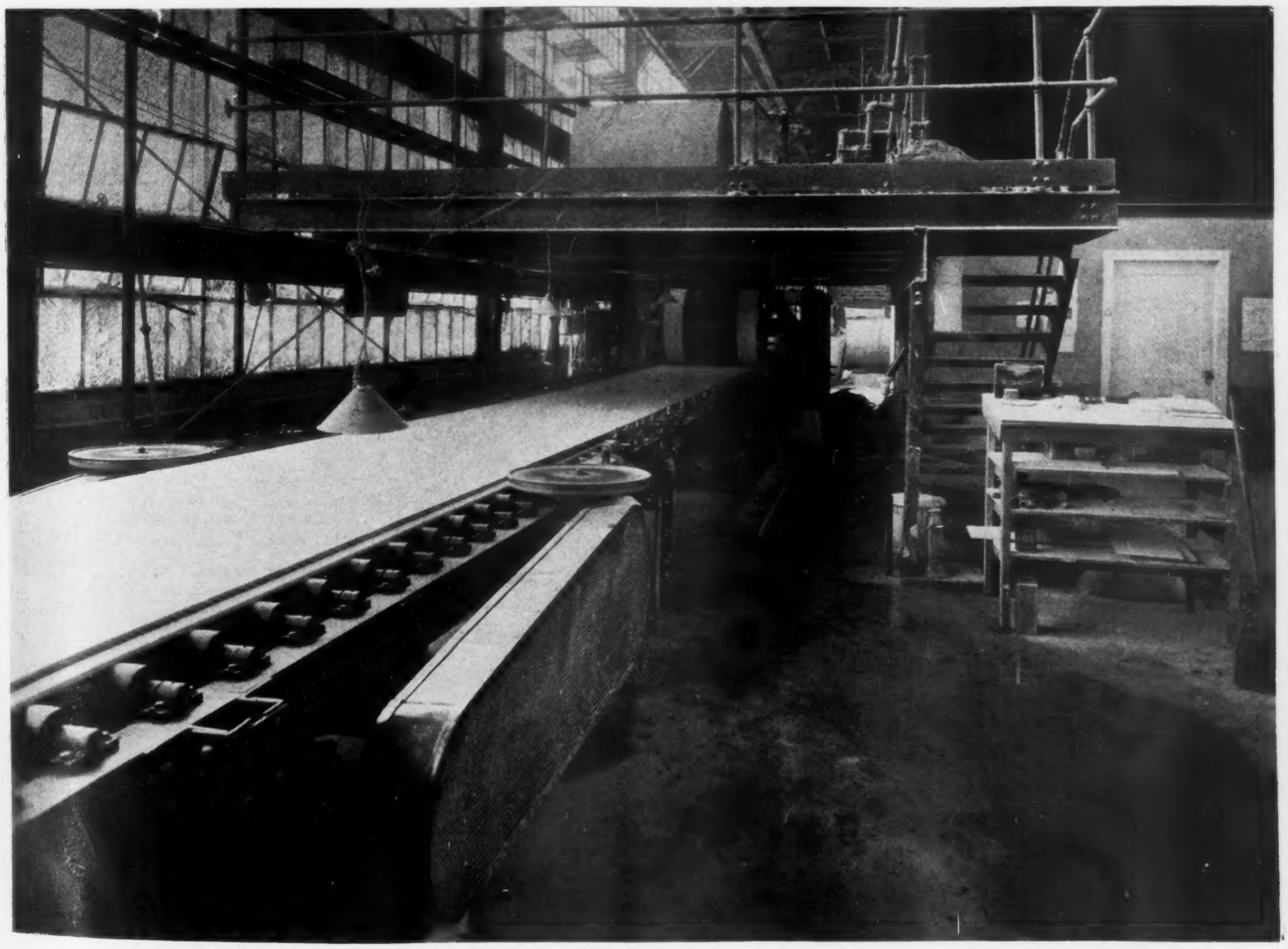
IN addition to gypsum tile as a structural commodity we have gypsum plaster board and wall board, the former developed within the past 25 years, the latter within the past 14 years. These, like the tile, have been developed mostly by the large gypsum manufacturers, and their success may be judged from the fact that today the demand for these products has reached such proportions that their manufacture probably represents the largest and most profitable branch of the gypsum industry.

Plaster Board

On May 22, 1894, Augustine Sackett of New York, N. Y., was granted Letters Patent No. 520,123 on an "Inside Wall Covering," composed of "webs of paper alternated with layers of hard adherent plastic substance" . . . to be used "as a substitute for lath and plaster."

While gypsum plaster was not definitely specified as the "plastic substance" to be used, it was found to be the best, and eventually proved to be the only satisfactory material for the purpose. Thus a board or panel made up of alternate layers of paper and gypsum plaster came to be known as "plaster board." And while the patent specification claimed such a board as "a substitute for lath and plaster," as developed and manufactured, it became a substitute for lath only. The inventor must be given credit, however, for having "vision" considerably in advance of his time, for it was nearly 20 years later that a board was developed that was really accepted as a substitute for lath and plaster, the idea being fundamentally as set forth in the original specifications.

It was approximately 10 years after the Sackett patent was issued that suitable machinery was developed for the production of "plaster board" on a sufficiently large scale as to make it a commercial and economic success. The merits of the product were quickly recognized and the demand grew rapidly. Sackett board as finally produced was composed of four strips of paper interlaid with three thicknesses of gypsum plas-



A modern type of gypsum wall board machine in use at one of the newer wall board plants

ter. The face dimensions were 32x36 in. and ¼ in. in thickness. These dimensions are practically the accepted standard for plaster board today, although other dimensions may be had, as, for instance, 24x36-in. face dimensions and ⅜-in. thickness; in fact, the demand for the ⅜-in. thickness is probably much greater than for the ¼-in. dimension.

Sackett board is still produced in large quantities today, it having been improved in 1912 by the Utzman patent folded edge, the edges having been previously left raw exposing the rough edges of the alternating layers of plaster and paper. The folding of the edge has done much toward producing a board of very attractive appearance, besides giving the edge an extra reinforcing due to the overlapping of the top and bottom papers of the board. (See Fig. 1.)

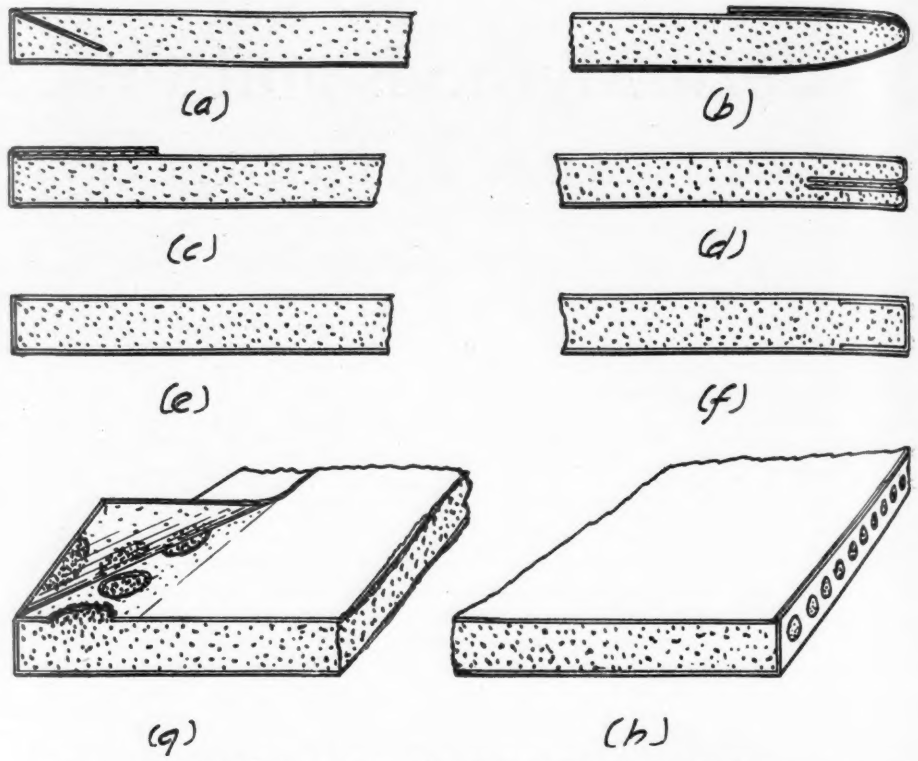


Fig. 1. Typical folds for inclosing the edges of wall board with the paper covering—(a) Original folded edge for plaster and wall board—face paper folded under back paper; (b) and (c) Face paper folded over back paper; (d) Both papers folded to center; (e) Face paper just meeting back paper—no folding; (f) Insertion strip sealed between papers; (g) Back papr punched to allow plaster to make seal through holes; (h) Face paper punched to allow plaster to anchor enclosing edge in place. Types (d), (e), (f) and (h) may be made reversible

Improvements in Manufacture of Plaster Board

Since the expiration of the Sackett patent a great number of patents have been issued on "improvements" in plaster board, most of these providing a specially formed board surface for the purpose of giving a mechanical key in addition to the natural bond between the board and plastering. In some cases dove-tail grooves are formed in the surface, in others the surface paper of the board is punched so that when the board is formed the plaster is pressed through these holes, forming buttons of plaster on the surface of the board, thus providing direct contact between the internal plaster of the board and the final wall plaster. Also deep grooves or notches are sometimes cut in the board after it is finished, thus providing a mechanical key. (See Fig. 2.) These devices are practically useful only when it is desirable to waterproof the surface paper of the board, as, for instance, when it is used as outside sheathing as a base for outside stucco work.

Figure 7 illustrates clearly the bonding action between the paper sheets and gypsum plaster which go to make up a plaster board. This illustration shows a highly magnified section of plaster board employing four sheets of paper in its construction. Note how the gypsum in solution has penetrated the paper and become crystallized, thus forming a perfect interlocking between the gypsum and the fibres of the paper. When plaster board is plastered as in a finished wall we have the same action taking place, the plaster interlocking with the fibres of the paper and forming a perfect bond. Tests have shown that the bond between the plaster and paper in a properly manufactured plaster board is much stronger than that between the internal fibres of the paper itself. In other words, in a breakdown test separating the final plastering from a plaster board base a layer of paper will adhere to both the plaster of the plaster board and to the plaster removed, showing the separation to be in the paper. The strength has not been shown to be increased by perforating the surface sheet of the board. In any event, it has been shown by test that the bond between the plastering and a plain paper surface plaster board has a factor of safety of about 600 (assuming ½ in. of plaster).* It would seem, therefore, that except in special cases, the specially processed surfaces would not be required.

The great bulk of plaster board, as manufactured at the present time, is composed of but one thickness of plaster faced each side with paper, a 30 point filled news being commonly used. The plaster mixture is made comparatively thin, using a maximum of 15% sawdust as a filler. More recent formulas have replaced the sawdust with other ingredients.

*"Incombustible Lathing Material," by Virgil G. Marani, The Gypsum Industries, Chicago.

Advantages of Plaster Board

The chief advantages of plaster board, and which have produced a country-wide demand for this product in preference to other lathing materials, are as follows:

(1) Rapidly installed.
(2) Perfect bonding with gypsum plaster.
(3) Less plaster required.
(4) Non-combustible and highly fire resisting.

Gypsum plaster board is nailed directly to the wooden studs in frame construction, or is clipped with special metal clips to steel supports where fireproof construction is used. Each standard board of 32x36 in. covers a wall area of 8 sq. ft. Twenty to thirty 3d common nails are usually driven

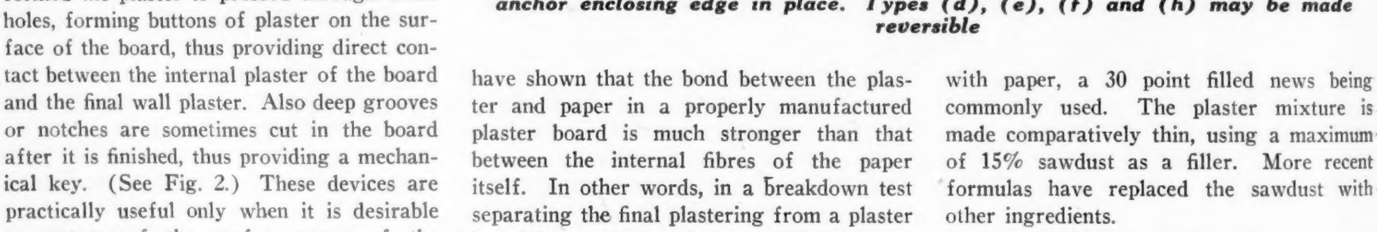


Fig. 2. Types of specially formed board surfaces for giving a mechanical key in addition to the natural bond between the board and plastering

to each board, depending on whether they are being placed on the side walls or ceilings; thus it is easily seen how rapidly this material may be applied. The steel clips are as readily applied as nails. In placing plaster board, the joints are broken wherever possible so as to eliminate any tendency for the final plastered surface to crack. There will be no danger of cracking at any other point, since there is practically no expansion or contraction in the board itself. Figs. 3 and 4 show the application of plaster board to wood studding and steel construction respectively. Cutting and fitting of plaster board may be easily and quickly done by sawing, or scoring with a sharp instrument and breaking.

When using a plaster board ¼ to ⅜ in. in thickness ½ in. of plaster is highly sufficient. This gives ¾ to ⅞ in. of practically solid plaster. Thus we have a base requiring much less plaster than other lathing materials, besides having a heavy wall of gypsum, the fireproofing qualities of which have been fully explained in "Gypsum Tile." Due to the fire resisting qualities of plaster board it is often used without plaster as a covering for the timber work in mill type construction, warehouses, etc. (See Fig. 3.)

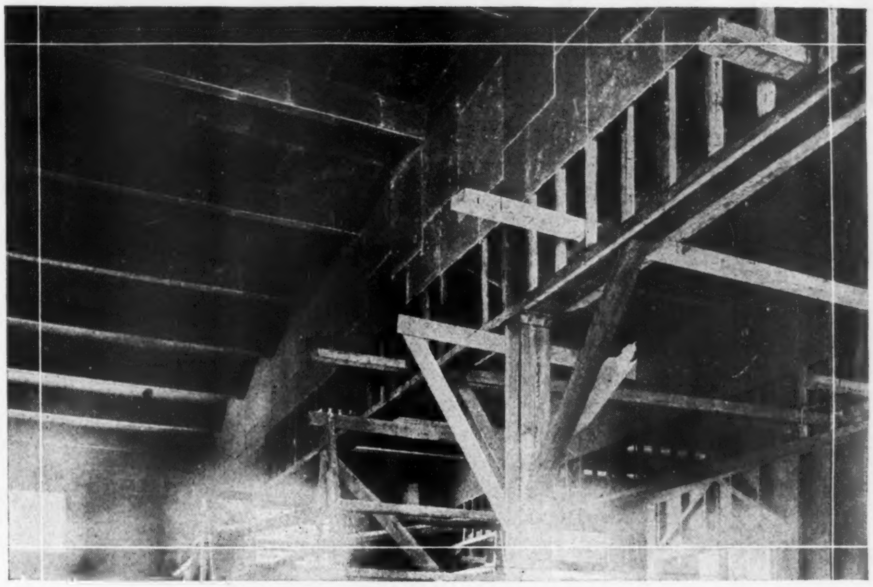


Fig. 3. Showing application of plaster board in frame building. The roof trusses and other timber members are protected from fire by encasing them in unplastered plaster board

Manufacture and Uses of Wall Board

"Wallboard" is simply a plaster board of larger size, more refined in quality, with special paper surfaces, and designed to be used without plaster. It has been on the market about 14 years and was primarily an outgrowth of the plaster board development coupled with a demand for a wall that could be quickly and economically erected and at the same time retain the highly fire resisting qualities of a gypsum wall.

Gypsum wall board is usually ⅜ in. in thickness, 48 in. in width, and varies in length from 6 ft. to 12 ft. Considerable wall board is manufactured on the Pacific Coast having a thickness of but ¼ in.; however, the great bulk of this commodity is ⅜ in. thick, and the tendency will probably be toward still greater thicknesses.

Like plaster board, gypsum wall board is composed of one thickness of plaster faced both sides with paper. The paper, however, is of different quality than that used in plaster board manufacture. The inner liner lying next to the plaster core of the board must necessarily be of a quality similar to that used in plaster board manufacture in order to make the proper bond with the plaster. The outer or exposed face of the paper, on the other hand, since it is designed to receive no plaster, may be of much harder texture and is usually given an attractive and uniform color. In order to maintain the desired unblemished appearance of the face of the board it is imperative that none of the plaster solution penetrate to the face of the board during its initial set. To accomplish this the inner liners of the paper are sized with a glue size, which prevents this penetration. Most wall board is made so that but one face of the board may be used as the outside or exposed face, this face usually having a paper of higher quality than the "back paper." Some attempt has been made to produce a "reversible" board so that in case one face should become damaged the other could still be used with equal advantage. While this does not seem to be of particular importance it may be quite readily accomplished by using the same quality of paper both sides and forming symmetrical edges. (See Fig. I.) Also some effort has been made to produce a board with no paper at all. To date this has not been accomplished commercially. Considerable advantage, however, may be realized in the perfection of a board of this type.

The particular advantages to which the wall board industry owes its enormous growth are as follows:

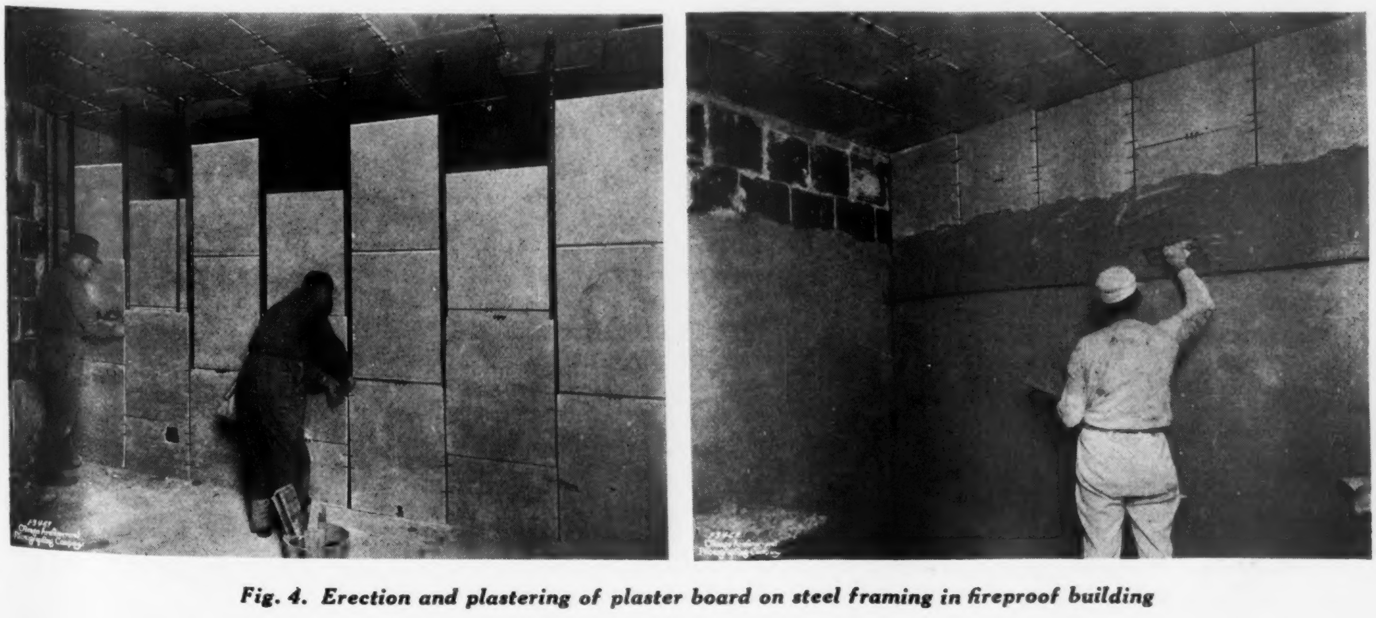


Fig. 4. Erection and plastering of plaster board on steel framing in fireproof building

(1) Wall board is rapidly erected.

(2) No plaster or plastering is required.

(3) Non-combustible and highly fire-resisting.

(4) Economical.

Like plaster board, wall board is nailed directly to the studs, and, being in large sized sheets, is even more rapidly erected. Wall board may be purchased to fit practically any ceiling height and to span the usual ceiling widths, thus necessitating but little cutting and fitting of boards. This, however, may be readily done when necessary. After the boards are in place the joints are filled with a specially prepared "joint filler," making an even, continuous wall. The wall may then be tinted or papered to suit. If desired the joints may be covered with strips or battens of wood, producing a paneled wall.

By using wall board all plaster and plastering is eliminated, thus saving time, material and labor in erection, besides producing a wall highly fire-resisting and economical in cost.

Manufacturing Process

Fundamentally the manufacture of plaster board and wall board is an identical operation. All commercial production of either commodity in the United States has been accomplished by machinery, the original machines designed for making plaster board being, of course, much smaller than those later developed for making wall board, on which either plaster board or wall board may be produced.

Fig. 5. Continuous type of wall board machine. The conveyor in left center brings the plaster to the machine

While the general design of the board forming machine proper has been much the same, two types of machines have been developed for the manufacture of plaster board, and practically these same designs have been passed on the wall board manufacturer. These types are the so-called "short machine" and "long machine." The short machine is, as the name implies, of just sufficient length to allow the proper forming of the board, then cutting to proper length before the plaster core is set. This

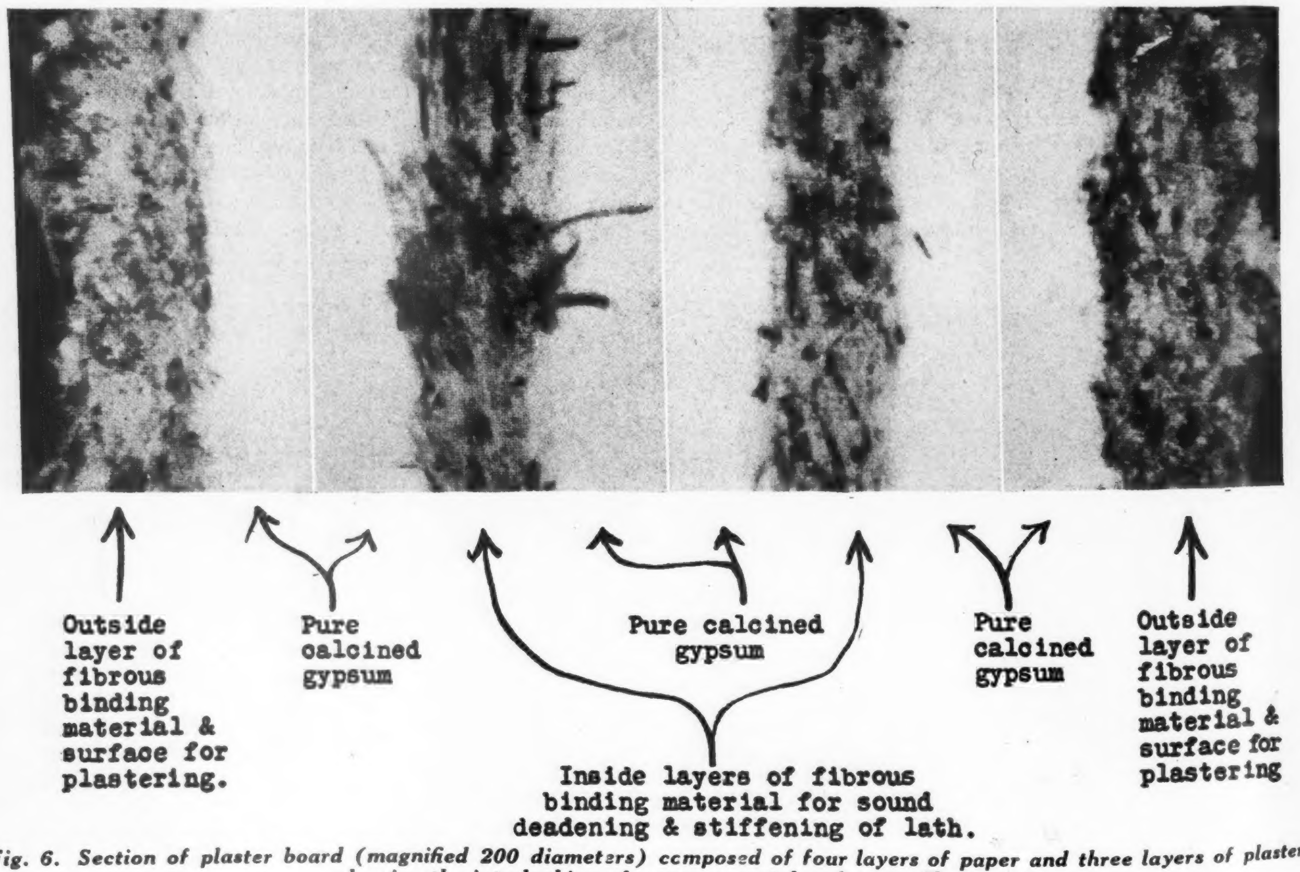
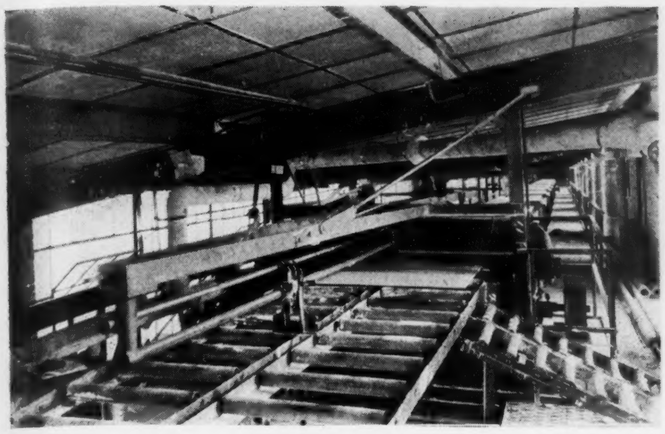
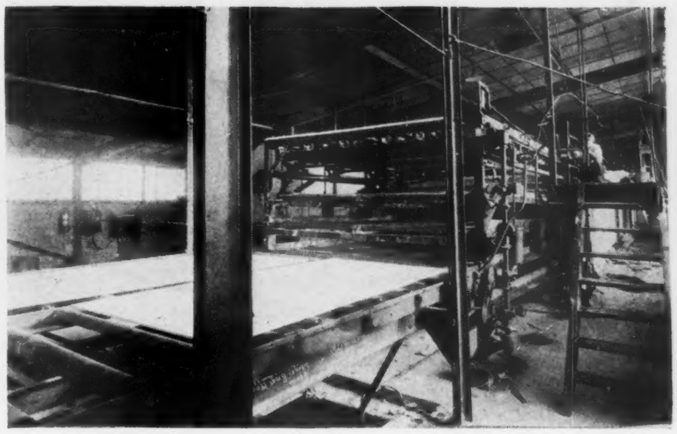


Fig. 6. Section of plaster board (magnified 200 diameters) composed of four layers of paper and three layers of plaster, showing the interlocking of gypsum crystal and paper fibres



Board approaching cut-off saw



Board about to enter roll drier

operation is usually intermittent, time being allowed for cutting each board as it is formed by the forming rollers. The operation may be made continuous by employing a cutter so designed as to compensate for the forward movement of the board during the cutting operation. After cutting the boards to the required length they are piled on a flat portable wooden tray, in the case of the plaster board, and usually on a car with a large platform, in the case of the wall board. The number of plaster boards placed on the trays are limited to the number that may be easily carried by two men. When the tray is thus filled it is placed aside in a rack or on a table to allow the plaster to set. The wall board placed on cars is piled to a depth of 12 to 18 in., and where this type of board is made in rough lengths and with raw edges it may be trimmed to accurate dimensions at this stage. This may be done by means of circular saws of sufficient size to cut the depth of the pile of boards and so spaced to give the required width or length.

Types of Wall Board Machines

The short machine for making plaster board has practically passed out of existence today, it having been discarded by the large board producers many years ago. This type machine was never used by these producers for making wall board, although perhaps one or two small manufacturers continue its use for this purpose. Its only advantage lay in its lower first cost and smaller floor space required for the machine itself.

The large producers of both plaster and wall board adopted the long continuous type machine almost from the start. In this machine the board is continuously formed and caused to travel on a belt conveyor until the plaster core has thoroughly set. The board is made in exact widths, the edge being either folded or sealed in such a manner as to give it a finished appearance and no trimming is necessary. (See cut on p. 45.)

The length of the board made on the long machine is regulated by means of a tripper actuating a perforator or cutter. In the earlier days of plaster board making a saw-toothed perforator was used, a perforating blade being mounted on each of a pair of shafts, one revolving above and the other below the board. The speed of revolution of these shafts was such as to bring the blades together at just the proper interval to give the correct length of board. The shafts were geared together so the board was positively perforated simultaneously on the top and bottom faces. When the board reached the end of the machine the "take-off" operator raised the board slightly, causing it to break along the line of the perforations, thus producing board sections of the proper length for the market. With the advent of wall board it became necessary to completely sever the board sections, as they were too unwieldy to be broken as had been done with the plaster board.

(To be continued)

Gypsum in the Manufacture of Ammonium Sulphate

THE Badische company, Germany, is producing around 2500 tons of ammonium sulphate per day, utilizing the sulphur content of gypsum, according to a report in *Commerce Reports*. In this process, the calcium sulphate yields calcium carbonate and ammonium sulphate in the presence of ammonia, carbon dioxide and water. Its greatest disadvantage lies in the inability of the producer to dispose of the calcium carbonate. The Badische company presents each purchaser of three carloads of ammonium sulphate (30 metric tons) with one carload of calcium carbonate, f.o.b. Merceburg.

Diatomaceous Earth of Florida

THE diatomaceous earth deposits of Florida are finer and lighter than similar deposits in other parts of the United States, the reason being that they are younger, geologically speaking, and are not contaminated by the elemental oxides such as aluminum, iron, calcium, etc. Because of the great degree of purity it can be used where other diatomaceous earth from different localities would not be suitable.

The diatomite of Florida, which is of such exceptional purity and consequent adaptability both for new and present uses, is found in Lake county. In between the hills are expanses of fresh water, reed and grass grown, under which are the beds of diatoms and diatomite, for the new and the old are both present. The deposits are depths of a brownish gray mud.

A suction dredge which has a boom end equipped with a rotating knife bearing head, just at the intake line, is used for dredging. The material, rich in organic matter, is water-born to long sluiceways, by which it is carried to cloth-lined settling basins or vats. After drainage, the material, now rather solid, is handled in chunks, which are air dried and then taken to rotating hot vacuum chambers, at which exit the material is now of very lightweight boles or irregular ball-like masses. These masses, due to the presence of very dry organic matter, burn readily and are passed into incinerating furnaces under blast and burned at a high heat. The product is now of masses of the snow-white, practically pure silica infiltrations of the skeleton walls of long-dead diatoms; of exceeding fineness; of the lightest weight known, running on an average of about 8 lb. per cu. ft., and of the highest fusing point.

After passing the furnace it is broken up and screened and is ready for packing for shipment.—L. M. Drake in the *Manufacturers Record.*

Canadian Talc Production in 1925

ACCORDING to statistics issued by the Dominion Bureau of Statistics, there was an appreciable advance in the production of talc and soapstone in Canada during 1925. Shipments totalled 14,474 tons valued at $205,835 in 1925 as against 11,332 tons at $154,480 in 1924.

The Ontario production of talc was obtained from deposits in Hastings county. Practically all of the Quebec shipments consisted of soapstone blocks for use in lining the alkali recovery furnaces of sulphate (kraft) pulp mills. A small tonnage of ground talc was shipped from a deposit at Wolf Creek, Victoria Mining Division, British Columbia.

Efficient Virginia Lime Operation

Augusta Lime Co., Staunton, Va., Buys Two Other Companies and Erects New Plant

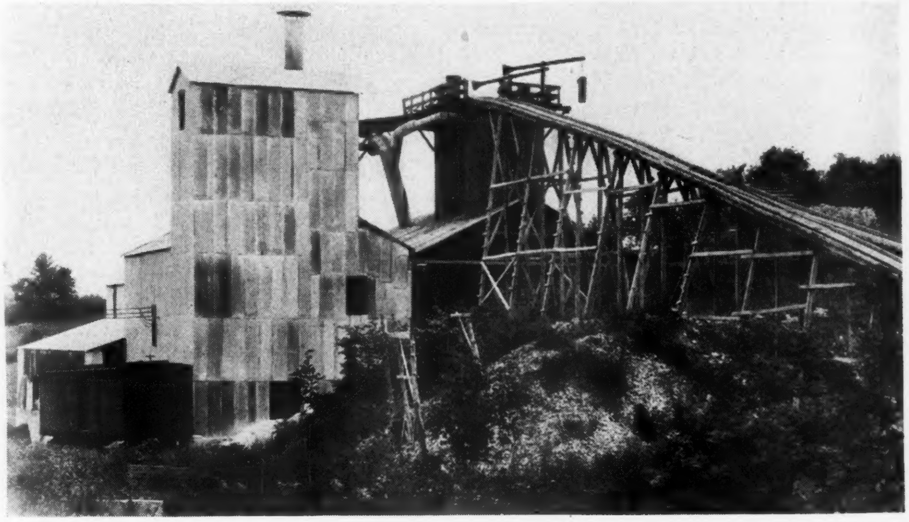
EARLY this year the Augusta Lime Co., Staunton, Va., bought out the Staunton Lime Products Co. and the Potomac Lime Co. The Potomac company operated 5 kilns and a hydrating unit, situated on the C. & O. canal near Harper's Ferry, W. Va. The Staunton company operated 2 kilns on a location about 2 miles east of Staunton.

It was found necessary to either move the Potomac company's plant or build a railroad spur to it, for the canal used for transportation purposes had been put out of use because of high water. Accordingly, the company found it to be desirable to move the plant and equipment to a new location; that of the Staunton company's site near Staunton. This was carried out early in the year.

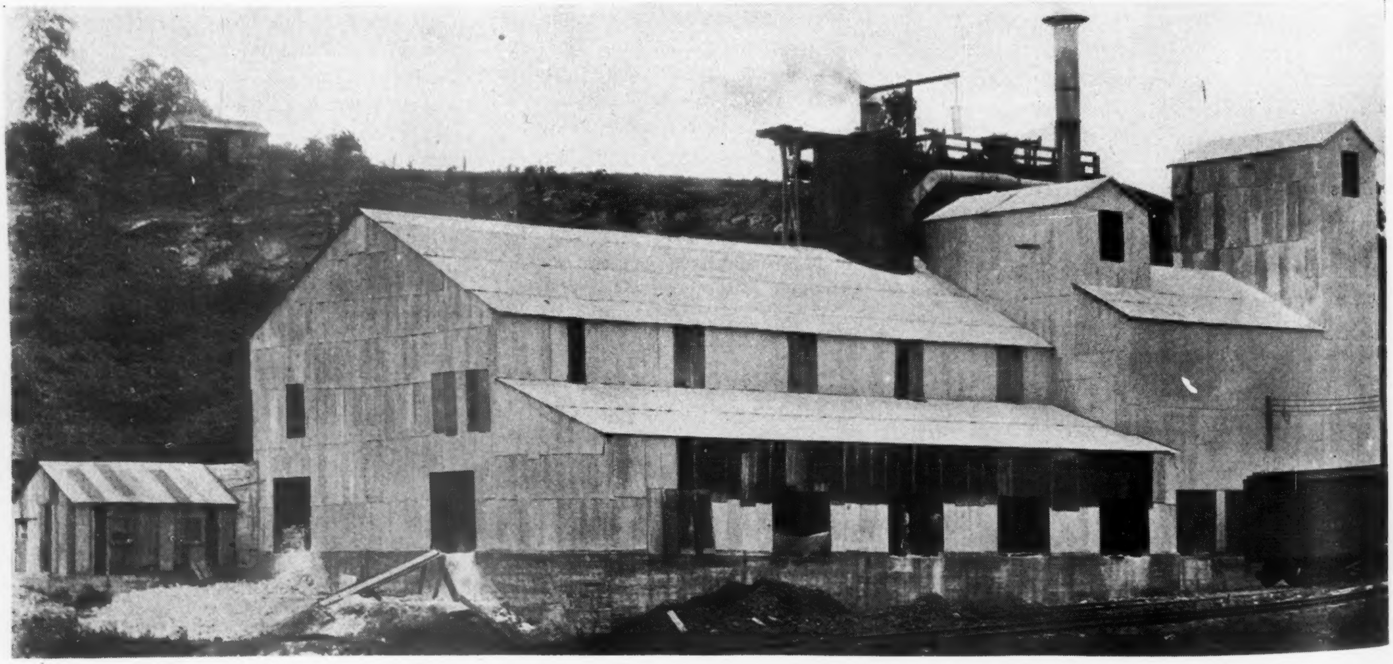
The new plant, designed and built by Richard K. Meade and Co., Baltimore, Md., was put into operation in June. The Meade company also were in charge of the removal of the old plant. The new operation consists at present of three Meade kilns, but arrangement has been left in the design for the future installation of four additional kilns when needed. Both buildings are of steel and concrete construction. The kiln building is 60x90 ft. and the hydrating building 30x60 ft. In the latter is installed a Kritzer hydrator, Raymond mill and air separation system, a Sturtevant crusher and a Bates packer. The entire plant is electrically operated, Allis-Chalmers ball-bearing motors being used throughout the entire plant.

Quarry property consists of 12 acres owned in fee and 6 acres under lease. The stone is a high calcium limestone, but there is a single vein showing about 20% magnesia. Drilling is all done by compressed air—Ingersoll-Rand jackhamer drills being used. An electric hoist raises the stone to the top of the kilns, where it is dumped into a bell hopper similar to that used on blast furnaces. Smoke and gases from the top of the kilns are taken off by induced draught produced from a Jeffreys fan located on the firing floor. Water for all purposes is obtained from a well on the property and a Fairbanks-Morse deep well pump, electrically driven, is used for pumping.

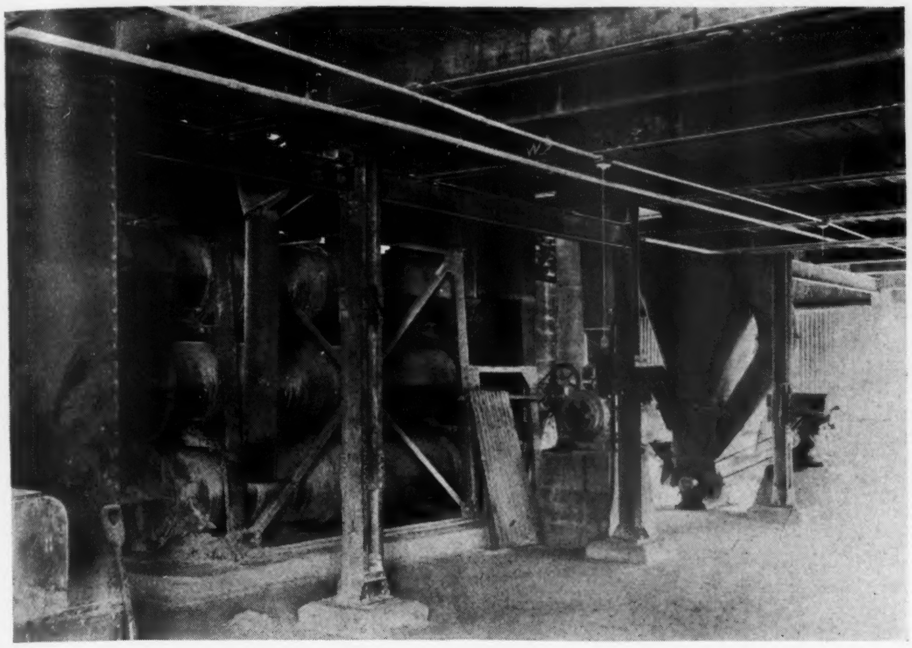
A spur track connects the plant location with the C. & O. and B. & O. railroads. The lime is marketed principally in the Atlantic coast line states between New York and



An electric hoist raises the stone to the top of the kilns where it is dumped into bell hoppers of the blast furnace type



New all steel and concrete plant of the Augusta Lime Co. The kiln building contains three kilns of a modern type and the hydrating plant is completely equipped with hydrating, crushing and packing machinery



Interior of the hydrating unit showing the hydrator and the grinding and air separating system used in connection with it

Jacksonville, Fla. Officers of the company are R. L. James, president; J. C. Brandon, vice-president; M. A. Denkle, secretary and treasurer, and N. C. Taylor, general manager. Offices are maintained at 18 Crowle Bldg., Staunton, Va.

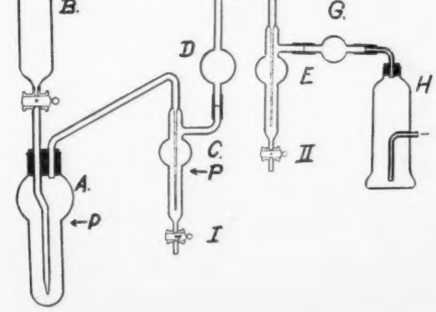
Direct Determination of Carbon Dioxide in Limestone or Lime Products

THE general accurate method of determining CO_2 in limestone or lime products is to decompose the material with acid and absorb the evolved gas in a suitable apparatus. J. E. Underwood of the research department, National Lime Association, has developed an apparatus which gives desired accuracy and reduces the ordinary length of time required to carry such work through. This procedure was described in the October issue of *Industrial and Engineering Chemistry* and the following abstract is taken from that journal:

The manipulation procedure varies little from that employed in using the ordinary train. Usual precautions are taken to sweep out the apparatus with carbon dioxide-free air before the determination is started.

The weighed sample in powdered form is boiled with hydrochloric acid. (In case of quicklime or hydrated lime, a catch sample should be made from a weighing bottle provided with a ground stopper.) The hydrochloric acid and water vapor are eliminated and the purified carbon dioxide is absorbed by any suitable absorbent. The apparatus containing the absorbent is disconnected and weighed. Provision may be made for the elimination of hydrogen sulfide if this is also generated with the carbon dioxide.

After introduction into tube *A* the sample is covered with water and the tube is attached to the apparatus. The previously weighed absorption bulb *H* is attached to *G*. Hydrochloric acid contained in separatory funnel *B* is allowed to flow into tube *A* until *B* is empty, the rate being governed by the rate of evolution of gas. The original amount of hydrochloric acid must be previously regulated so that the level of the contents of *A* is not above *P*. A current of carbon dioxide–free air is started through the apparatus and the contents of *A* brought to the boiling point. The form of *A* allows the gases generated to be quickly and effectively swept out. Water has been placed



Apparatus for the rapid determination of carbon dioxide in limestone or lime products

in tube *C* to point *P′*. The gases from *A* enter the water in *C* in very small bubbles. Although the contents are heated by the steam, practically no acid progresses beyond bulb *C*. The gases containing the carbon dioxide then pass through *D*, which is filled with mossy zinc. This not only acts as a condenser but also removes any hydrochloric acid passing *C*. The microdrier *E* is analogous to *C*, the water being replaced with concentrated sulfuric acid. The issuing gas from *E* passes through small bulb *G* containing phosphorus pentoxide, which eliminates the possibility of residual moisture or entrained sulfuric acid entering the absorption bulb.

Although any carbon dioxide absorption apparatus may be used, an ordinary Midvale bulb, *H*, is found satisfactory when Ascarite is used as the absorbent. To preclude the loss of the moisture produced in the absorbing reaction, the gases are also passed through a layer of phosphorus pentoxide which is separated from the Ascarite by glass wool. The Ascarite and dehydrating agent are consequently weighed together. In preparing this bulb a layer of glass wool, extending above the end of the outlet tube, is placed in the bottom, and on this a layer of phosphorus pentoxide from 6 to 10 mm. in thickness. Immediately above is another layer of glass wool, and the rest of the bulb is filled with Ascarite, except for a final layer of glass wool at the top to distribute the incoming gas evenly over the cross section of the bulb.

When the sample evolves hydrogen sulfide in the treatment with hydrochloric acid, another bulb exactly like *E* is interposed between *D* and *E*. This bulb contains a solution of cadmium chloride, which removes the hydrogen sulfide without disturbing the progress of the carbon dioxide.

Tube *C* gradually fills by condensation. This condensate is eliminated and fresh water again added by means of stopcock I. Frequently, at the same time, the train is disconnected between bulbs *D* and *E* and the former is also flushed out. Stopcock II may also be utilized in emptying and refilling *E*.

Canadian Lime Production in 1925

PRODUCTION of lime in Canada during 1925 increased 12% in quantity over the previous year's shipments, according to finally revised statistics just issued by the mining branch of the Dominion Bureau of Statistics at Ottawa. The year's production amounted to 10,256,542 bushels, consisting of 8,529,399 bushels of quicklime and 60,450 tons of hydrated lime, having a total value of $3,387,652.

In 1924 the total production was 9,136,952 bushels valued at $3,178,541. The average price throughout Canada for quicklime in 1925 was 32 cents per bushel, while hydrated lime sold for $11.30 per ton.

Importations of lime in the year under review were recorded at 4701 tons appraised at $47,639. Exports, according to customs' records, were 16,286 tons, worth $312,168.

In the 62 plans operated during the year, the capital invested was $5,154,046. Employment was furnished 89 salaried employes and 917 wage earners; their combined earnings totaled $960,434. Fuel and electricity costs were reported at $762,814. The total power installation comprised 179 units with a rating of 3867 hp., including 149 electric motors, rated at 2713 hp.

Lynn Sand and Stone Company Operation

Swampscott, Mass., Plant Designed and Built by J. H. Cooke Full of Interesting Kinks

J. H. COOKE, of Hartford, Conn., is one of the most experienced crushed-stone operators in the East. He was among the earliest to engage in the commercial crushed-stone business in New England, his first quarry being at White Oak (Plainville) near New Britain, Conn. The business expanded and he subsequently opened quarries and built crushing plants at Rocky Hill, near Hartford, and Mt. Carmel, near New Haven.

These operations were consolidated and another near Middlefield, Conn., added, about 25 years ago, to form the Connecticut Quarries Co., of which Mr. Cooke became vice-president and general manager. He held this office for about 15 years, resigning to promote the Hartford Sand and Stone Co., of which he is now president an downer. This company has a quarry and crushing plant at Farmington, Conn., and a sand and gravel plant at East Hartford.

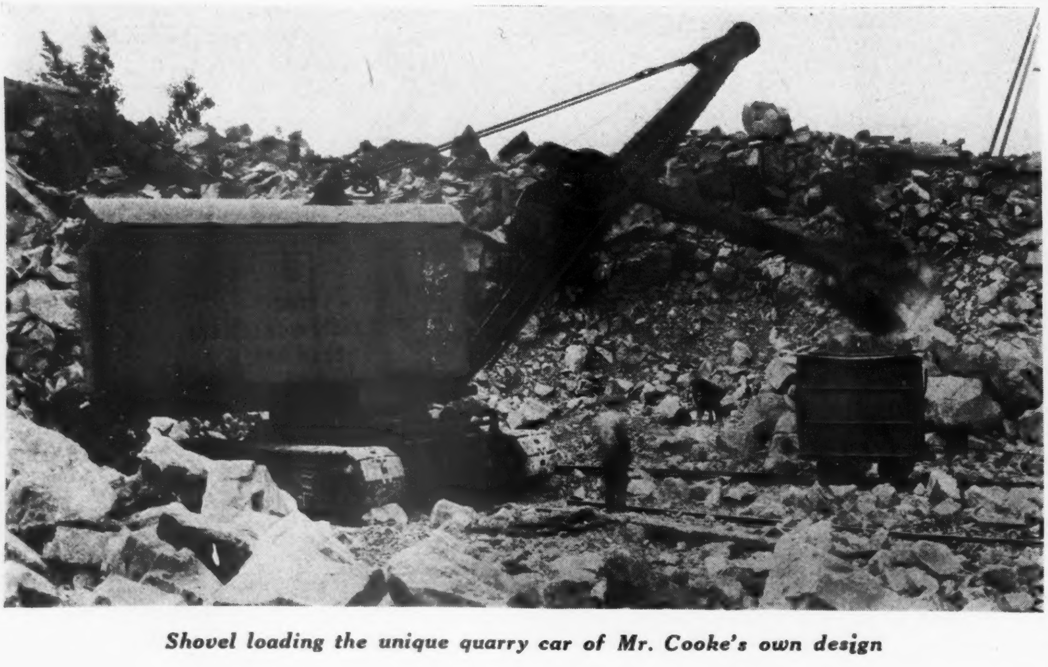
In 1920 Mr. Cooke decided to enter the Boston metropolitan territory and after considerable prospecting located his plant in Swampscott, just across the city line of Lynn. There he has built a model crushing plant, incorporating more original ideas and kinks than to be found almost anywhere else in one single operation. As many of these are complete little stories by themselves, we will detail them in subsequent issues under "Hints and Helps for Superintendents."

The rock is a very hard, close-grained, tough gneiss, exceedingly difficult to drill and blast. The quarry at present is operated in two levels, but eventually, when fully developed, it will be operated from the present lower level only.

Blast-holing is done with 6-in. well drills; two Loomis and one Keystone. Two compressed-air tripod drills, four Jackhamers (Ingersoll-Rand) and one N-72 light drifter are also used, the compressed air being furnished by a motor-driven I-R compressor.

For excavating and loading one Marion Model 31 steam shovel and one Marion 37 electric shovel are used. Both shovels are equipped with special manganese-steel dipper teeth, with extra long points, made by the Frog Switch and Manufacturing Co., Carlisle, Penn. These teeth are replaced every four or five weeks, which gives some indication of the abrasiveness of the rock.

The rock is a hard, close grained and tough gneiss, difficult to drill and blast

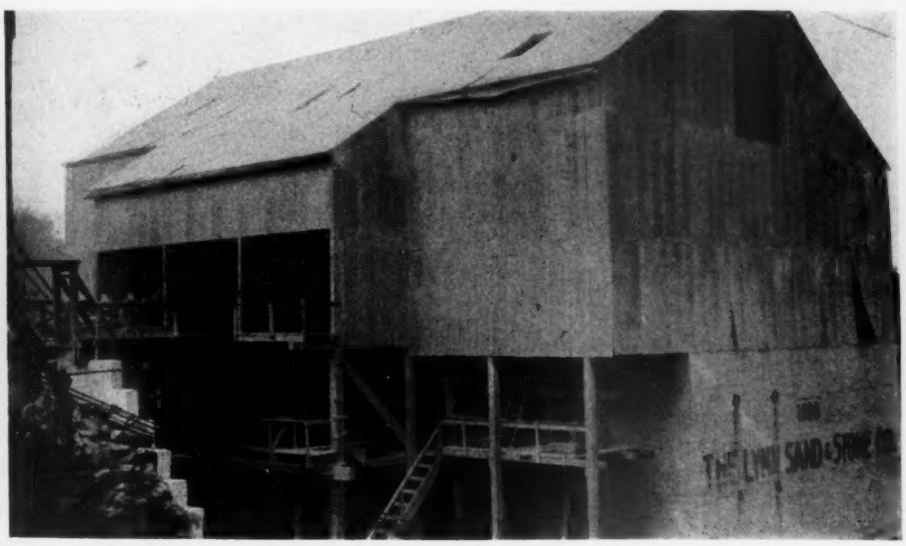


Shovel loading the unique quarry car of Mr. Cooke's own design

The quarry care are unique in some respects, and are of Mr. Cooke's own design. They are of two types, the older ones used on the upper quarry level holding 7⅓ tons capacity and the ones on the lower level 8 tons. Both types are equipped with special spring trucks, or axles, made by the Easton Car and Construction Co., Easton, Penn. The car wheels are also equipped with roller bearings.

The cars used on the upper level have very high sides, and on the 3-ft. gage railway tracks look as though they were in imminent danger of tipping over. However, they do not, owing to their stability on comparatively rough track to the spring supported body, which absorbs

Hoist and derrick which serves the gyratory crusher on the upper level of the plant



The timber structure rests on bins of reinforced concrete. The bridge connects the upper level of the quarry with the gyratory crusher

Track coming in on lower level where the cars are dumped to the hopper of the jaw crusher

the jolts without difficulty. The reason for the high-side bodies is to provide for an inverted V-bottor, which allows the cars to dump automatically from both sides simultaneously.

These cars are of all-steel construction. The side doors are hinged at the top and are released by a lever from a catch at the bottom, which hold the door, when it swings back into place, just as a steam-shovel bottom catches. Two 4-ton Milwaukee gasoline locomotives handle one, two or three cars at a time (a Plymouth 6-ton locomotive has since been added). The lower level cars are all-steel, one-way, side-dump cars. They are dumped by a special device with a 5-ton Euclid hoist suspended from the traveler of a 20-ton Armington crane, which serves the jaw crusher.

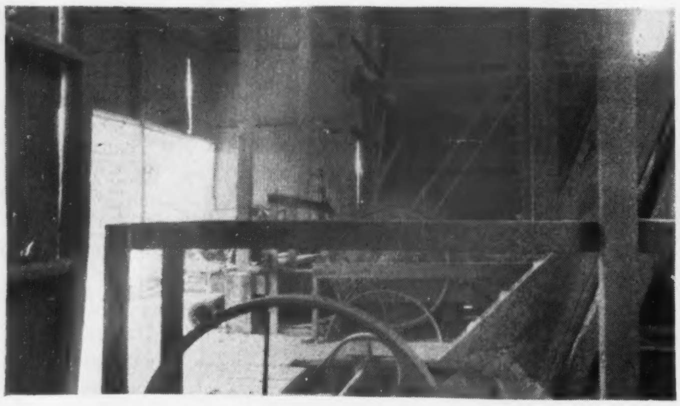
On the lower quarry level is the hopper opening to a 48x60-in. Traylor jaw crusher, belt driven from a 200-hp. Westinghouse motor. Through two jack shafts, this motor also drives the bucket elevator which takes the jaw crusher discharge. The rest of the plant is driven from a jack shaft by a 300-hp. Crocker-Wheeler motor. Both motors are 440-v., and both are equipped with recording ammeters, so that a complete record of power consumed is always available.

The jaw crusher setting is ordinarily 11 in. Its discharge goes to a 48-in. bucket elevator, 56 ft. centers, of Mr. Cooke's own design. The buckets are V-shaped, 48x24-in. (length of chain link) and 21-in. opening Their construction is shown quite clearly in one of the accompanying views. The rolls, links and sprockets are of manganese steel. The inside strips of the links are riveted to the buckets. This design has been patented by Mr. Cooke. They were built by the Hendricks Manufacturing Co., Carbondale, Penn.

The 48-in. bucket elevator feeds a 250-ton hopper into which the upper level quarry cars are also dumped. This large storage and feed hopper, ahead of the No. 12 Allis-Chalmers gyratory crusher, is one of the features of the plant and insures its continuous operation, even though quarry trouble temporarily affects the transportation system, or in case of the primary breaker being down. This crusher is served by a Mundy compressed-air driven hoist and derrick. This hopper discharges through a gate to the gyratory crusher.

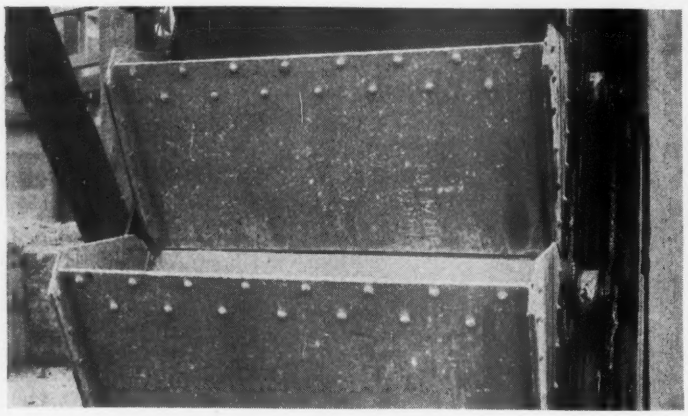
The No. 12 gyratory crusher is set to 5 in. and its output is received by a 42-in. bucket elevator (56 ft. centers) of the same type as that described. This elevator discharges to either side to a pair of 6x12-ft. scalping screens, of perforated manganese-steel plates. They have an inclination of 1:12. The scalping screen rejections go to two No. 6 gyratory crushers which return their product to the screening system.

The scalping screens pass 2-in. material, which goes to two 24-in. chain bucket elevators (one serving each screen and crusher) The elevators each deliver to a pair of siz-



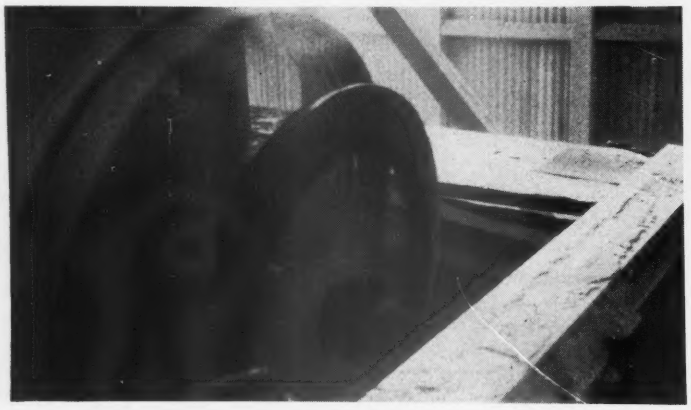
Machines are driven through jack shafts

Hoist for derrick

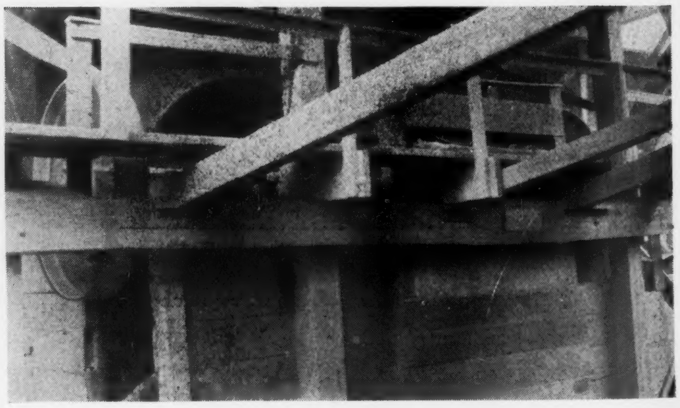


Construction of buckets

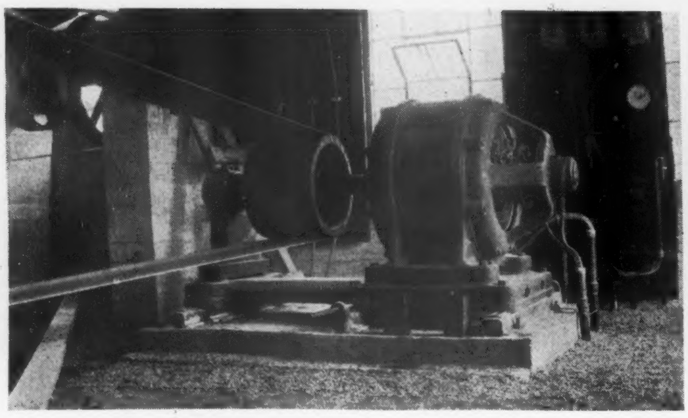
Head wheel of elevator



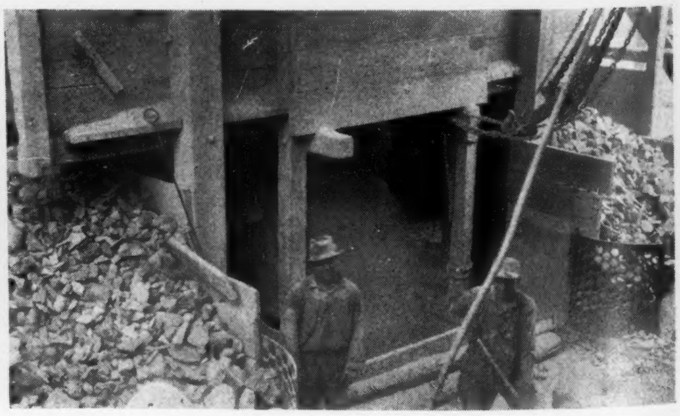
Detail of drive



The screen drive



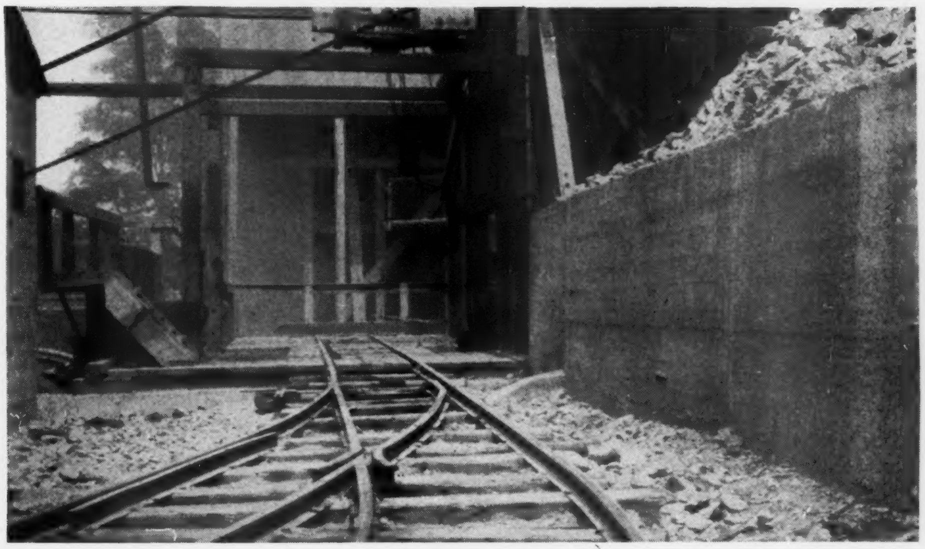
Belt drive from motor to jack shaft



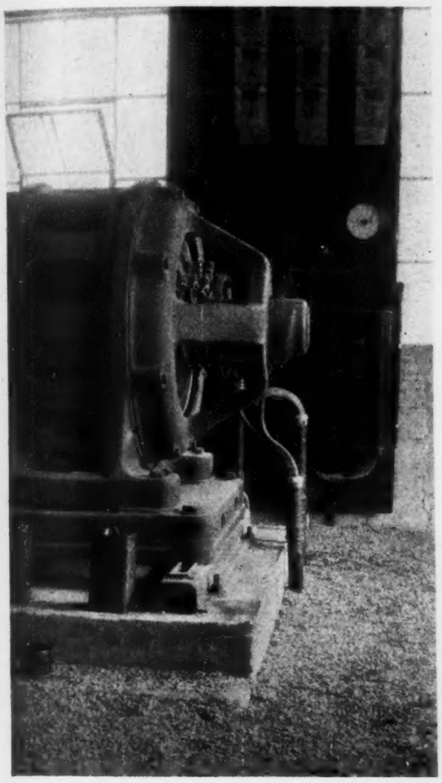
Oversize is fed to two gyratories

ing screens. The first sizing screen of each pair is 5x12 ft. with 1¾-in. round holes. The rejections from this screen go to one of two bins (2-in. stone). This screen has a 6x10 ft. jacket with 1-in. holes. The rejections from the jacket are 1-in. stone and go to one of three bins.

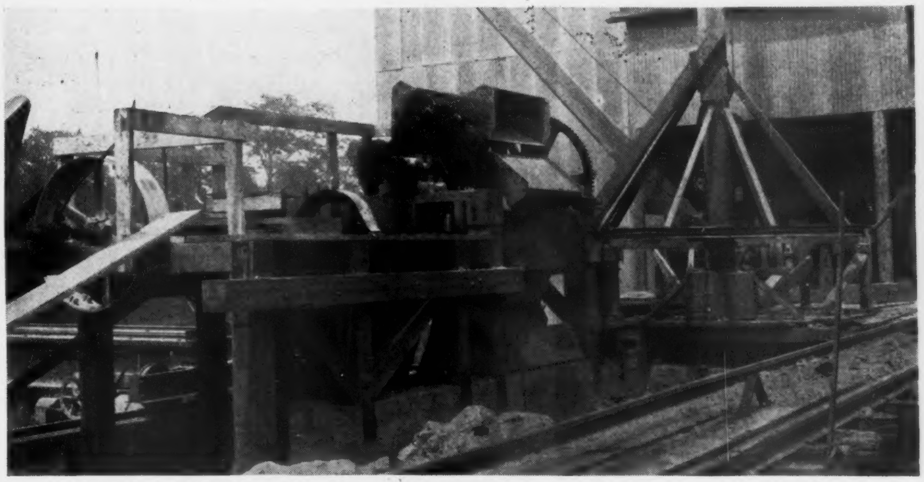
The material passing the 1-in. perfora-



Care are dumped by a special device operated from a 5-ton hoist which is swung from the arm of a crane

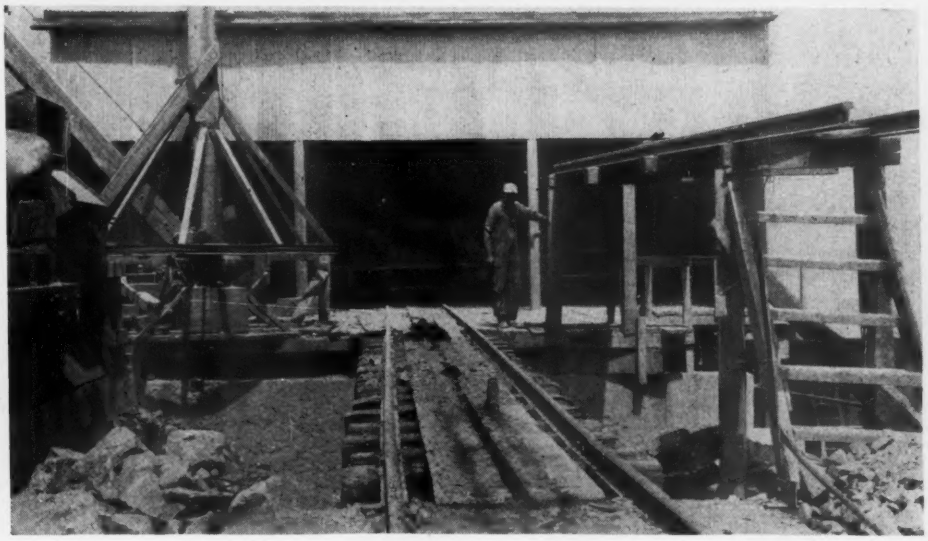


Crusher motor

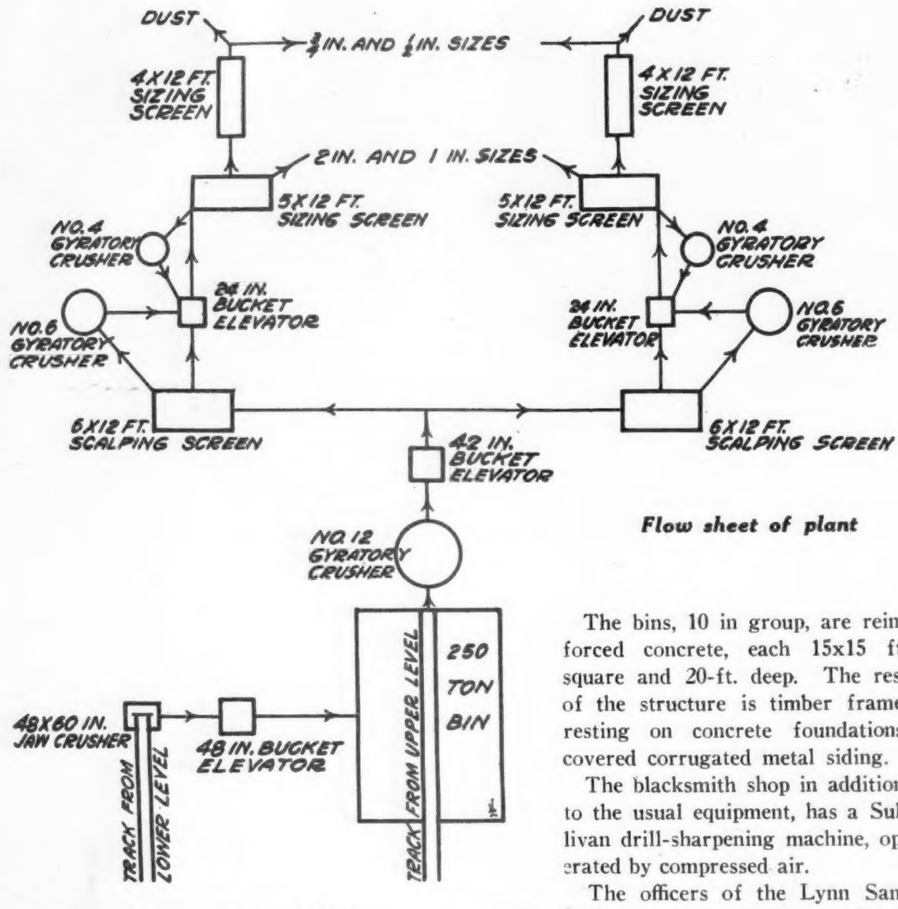


This 48-in. elevator lifts the discharge of the jaw crusher to the large hopper which feeds the gyratory crusher

The No. 12 gyratory crusher



The very large hopper above the gyratory crusher is one of the unusual features of this plant



Flow sheet of plant

tions of the jacket goes to a 4x12-ft. screen with a 5x10-ft. jacket where ¾-in. and ½-in. stone are separated in the same manner (⅝-in. round holes in screen and ⅛-in. mesh wire on jacket). The minus ⅛-in., or dust, goes to a separate bin. There are two bins each for 2-in., ¾-in. and ½-in. and three bins for 1-in., which happens to be the size most in demand. Each screen and jacket makes but three separations.

To provide for reducing the 2-in. stone to smaller sizes the chutes for this material may be made to divert it to two No. 4 gyratory crushers, which return their crushed product to the 24-in. bucket elevators feeding the sizing screens. These crushers, as well as the No. 6's previously mentioned, are each served by 10-ton Yale and Towne chain hoists. A little study of the flow sheet will show that this layout provides the plant with great flexibility without changing the screen sections, simply by re-crushing all the material which will not pass the 1¾-in. holes in first sizing screen.

Another factor in the flow sheet that is not common, and which is a distinct advantage, is that the screening and final crushing units are in duplicate, entirely distinct from one another. This means, of course, that the plant may be operated at half capacity without the wear and tear on equipment not needed, and also at some saving in power consumption. More than that, however, it is insurance against interruptions to production by necessary shutdowns of a part of the screening and crushing machinery.

The bins, 10 in group, are reinforced concrete, each 15x15 ft. square and 20-ft. deep. The rest of the structure is timber frame, resting on concrete foundations, covered corrugated metal siding.

The blacksmith shop in addition, to the usual equipment, has a Sullivan drill-sharpening machine, operated by compressed air.

The officers of the Lynn Sand and Stone Co. are J. H. Cooke, president; W. D. Manchester, superintendent; H. W. Kummel, secretary, and P. C. Cooke, son of J. H. Cooke, quarry superintendent.

Chert in French Chalk Cliffs

WRITING in the *Engineering and Mining Journal*, Hiram W. Hixson describes the chert and flint found in the chalk cliffs at Etretat, France. These, he says, show plainly that they were formed by the penetration of silica bearing solutions which entered fissures in the chalk and deposited silica in the form of chert or flint and in some scattered cases, opal. The solutions were of the same sort that turn sandstone to quartzite. To prove that the cherts and flints were of "magmatic" and not of "concretionary" origin samples were assayed for gold and showed a small gold content. It is suggested that somewhere in the many square miles of chalk deposits in France a workable gold deposit of similar origin may lie.

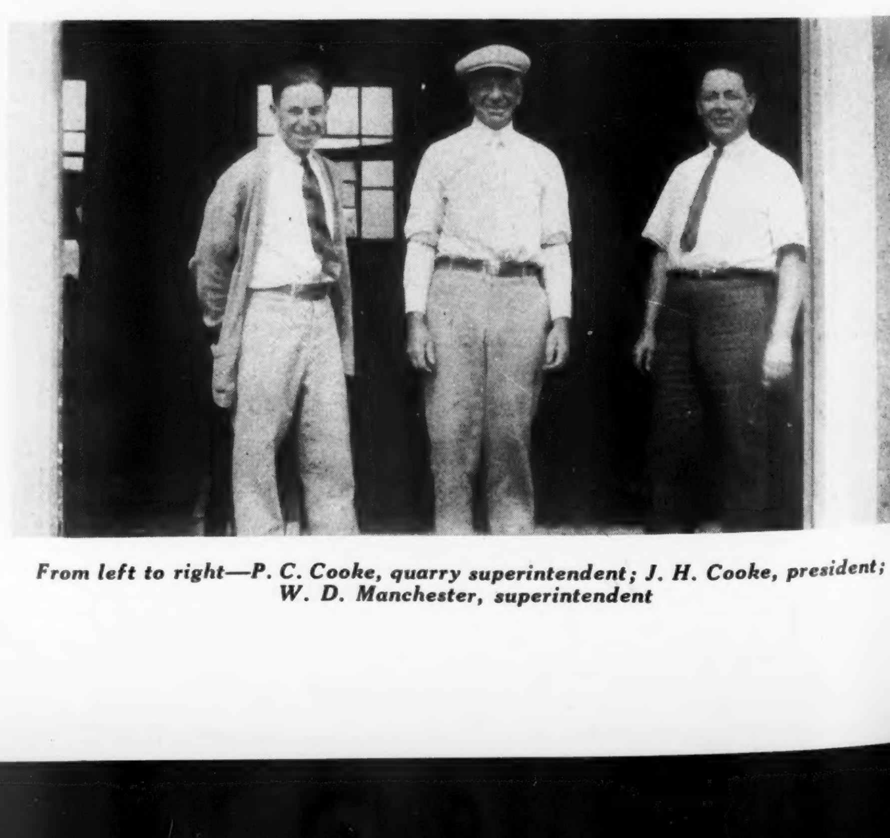
Mr. Hixson surmises that the solutions were alkaline with sodium hydroxide that had dissolved the silica and also contained carbon dioxide that dissolved the chalk. The lime from the chalk displaced the sodium hydroxide and thus precipitated the silica and the lime was afterwards removed in solution by the water containing carbon dioxide.

The general opinion has been that flints and cherts in limestone were of concretionary origin. Mr. Hixson points out that if this were true the quartz crystals found would point outward instead of inward and that flint and chert would be more abundant at the surface than at depth, which is not the case in the French chalk deposits.

The article does not compare the flints and cherts in the French deposits with those of American limestone deposits which may or may not have had a similar origin.

Graphite Plants to Reopen

GRAPHITE plants in Alabama are beginning to resume manufacturing activity after being shut down for about seven years. Superior Flake Graphite Co. of Clay county and Ceylon Graphite Co. in Coosa county are producing steadily. The resumption of these operations is due in part to the protective tariff that the government has recently placed on graphite and in part to the fact that the oversupply shipped in during the war is about exhausted. The largest and most consistent deposits of flake graphite in the United States are to be found in Alabama. When the need for graphite was urgent in 1918, Alabama produced 7,795,475 lb., which was over 60% of the country's total production.—*American Metal Market.*



From left to right—P. C. Cooke, quarry superintendent; J. H. Cooke, president; W. D. Manchester, superintendent

The Design of Stone Crushing Plants

Part VII.—A Plant Designed to Make Many Sizes of Crushed Stone

By Hugo W. Weimer

Consulting Engineer, Milwaukee, Wisconsin

THE lay-out of the plant to be discussed in this article contains nothing that has not previously been described by the writer as far as the crushing is concerned, but the screening arrangement described will no doubt be of interest to many readers. The primary crusher for this proposed layout is a 30-in. gyratory crusher which is capable of taking feed as handled by a 1½-yd. to 2-yd. shovel. This plant is to have a maximum capacity of 200 tons per hour, and the arrangement shown is capable of producing this tonnage. For the various sizes of products required to be produced by this plant the writer has based same on the standard sizes as specified by the requirements of a middle western state. Table No. 1 lists the basic sizes to be produced by this plant and in addition other possible sizes that can be made by a combination of the basic sizes. This can be accomplished by the spouting of two sizes of material into one bin or taking the load from two different bins. It will be noticed that no attempt has been made to designate the various sizes of product by number. Unfortunately there is no uniformity to the numbering system, therefore the only way one can clearly specify the various sizes is to give the minimum and maximum ring size permissible.

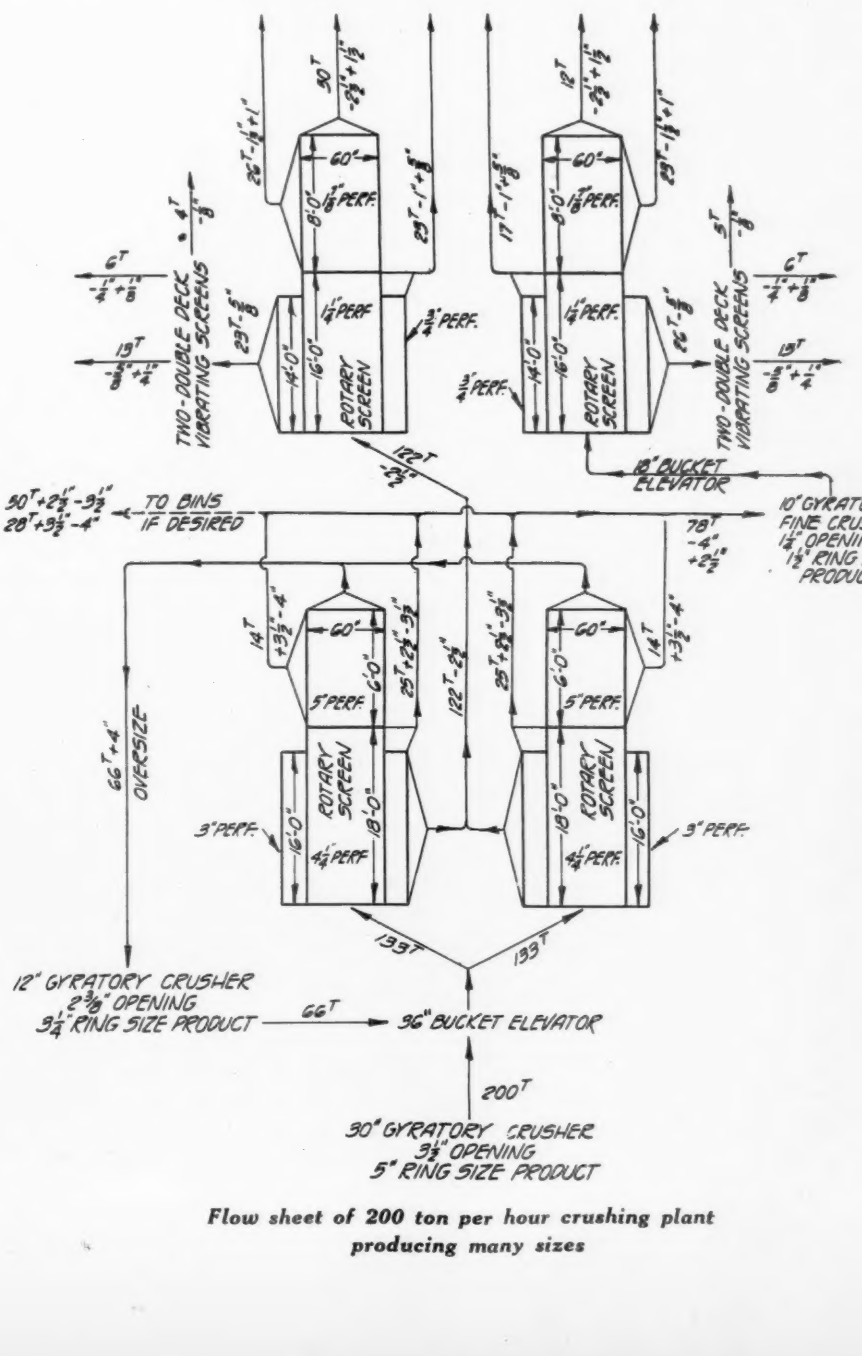
TABLE No. I.
RING SIZES OF VARIOUS PRODUCTS REQUIRED

Basic sizes inches	Combination sizes inches
—4 +3½	—4 +2½
—3½+2½	—1½+ ¼
—2½+1½	—1 + ⅛
—1½+1	—1
—1 + ⅝	— ⅝+ ⅛
— ⅝+ ¼	— ¼
— ¼+ ⅛	
— ⅛	

To produce a great many products, as required by this plant, necessitates considerable thought being given to the screening arrangement. As recommended on the flowsheet, there are four rotary screens and four vibratory screens required, the first two rotary screens being used for scalping, and also for a certain amount of sizing. It is not practical to set the primary crusher any closer than for a 5-in. ring size product and still obtain the required tonnage, therefore we will obtain considerably over the maximum of 4-in. ring size, which, however, cannot be avoided, and therefore this oversize is rejected by the first two screens and passed on to the 12-in. gyratory crusher for further breaking. The 12-in. crusher has been chosen because it has the required opening to take the maximum size of piece as discharged by the primary crusher and also has sufficient capacity to break the product so that it will not again be rejected by the first two screens. That is all that is required from this crusher, therefore it does not have to be of the modern fine crusher type. Another advantage in not crushing to a smaller size with this crusher is to avoid the greater amount of fines that are always produced when crushing to small sizes.

The first two screens produce three sizes of product in addition to the oversize material. The material passing through the first section and outer jacket is passed on without further crushing to a finishing screen which will be described later.

The main body of the screens is divided



Flow sheet of 200 ton per hour crushing plant producing many sizes

into two parts having 4¼-in. and 5-in. perforations respectively, which allow the passing of 3½-in. ring size in the first section and 4 in. in the second section. We will assume that the product from these two sections (which in one case is plus 2½ in. and minus 3½ in. and in the other plus 3½ in. and minus 4 in.) may be disposed of without further breaking except at intervals. Conditions will be assumed that require more of the smaller sized product, in which case the layout will be such that these two larger sizes can be passed on to a 10-in. gyratory fine crusher for further breaking. The product from this crusher would then be passed on to another screen for final sizing.

TABLE No. II.
GRADATION OF CRUSHER PRODUCTS

Ring sizes inches	30-in. gyratory Percentage	30-in. gyratory Tons	12-in. gyratory Percentage	12-in. gyratory Tons	10-in. fine crusher Percentage	10-in. fine crusher Tons
+4	33	66	....	....	....	....
—4 +3½	9	18	15	10	....	....
—3½+2½	17	34	25	16	....	....
—2½+1½	17	34	25	16	15	12
—1½+1	9	18	12	8	30	23
—1 + ⅝	8	16	11	7	22	17
— ⅝+ ¼	4	8	8	5	20	15
— ¼+ ⅛	2	4	2	2	7	6
— ⅛	1	2	2	2	6	5
Total	100	200	100	66	100	78

Table II lists the various sizes of product as produced by the three gyratory crushers. This data is compiled from the information given in the May 29 article of this series. This table of sizes is a basis for determining the percentages and tonnage of the various products. From this we know that 66 tons is rejected from the first screens and consequently the elevator must be based on handling 266 tons per hour when determining on its size. The discharge from this elevator is split in equal parts, making it necessary for each screen to handle 133 tons per hour, and a reference to the May 1 article will indicate the necessity of using a 60-in. diameter screen. If it were not for the fact that scalping is one of the functions of this screen the writer would recommend a 72 in. diameter. The material passing through the outer jackets of these screens is 2½ in. and less in size. The total amount of this material from these two screens is 122 tons, which can be passed on to a single 60-in. diameter screen for further separation.

The product ranging in size from 2½ in. to 4 in. as coming from these screens amounts to 78 tons per hour and if the total amount of this is required to be crushed to 1½ in. ring size it will be just about the limit that a 10-in. gyratory fine crusher can handle. The advantage of setting this crusher to produce 1½ ring size is that there need be no returns from the finishing screen, as it is not likely that any pieces would be over 2½ in. The two finishing screens, as the reader will note, produces three sizes of finished product and in addition passes on to the vibratory screen all material ⅝ in. and under which is then further separated by the vibratory screens into three different sizes as is clearly shown in the flow sheet.

TABLE No. IV.
LIST OF PRINCIPAL EQUIPMENT FOR CRUSHING PLANT ONLY WITH POWER REQUIREMENTS

Item—	Hp. required
1 30-in. gyratory crusher	175
1 36-in. bucket elevator, about 80-ft. 0-in. centers	50
2 60-in. by 24-ft. rotary screens with 16-ft. 0-in. outer jackets	48
1 12-in. gyratory crusher	50
2 60-in. by 24-ft. rotary screens with 14-ft. 0-in. dust jackets	48
1 10-in. gyratory fine crusher	75
1 18-in. bucket elevator, about 60-ft. 0-in. centers	15
4 Vibrating screens	12
Total horsepower required	473

From information published in previous articles Table No. III is compiled, which gives us the necessary length for each screen section of the rotary screens. It will be noticed that the writer is usually liberal, especially for the finer sizes, because in the calculations practically no allowance has been made for the fines that come to the plant with the original feed. For this reason the writer would recommend two double-deck vibrating screens to be used in connection with each rotary finishing screen. It is quite possible that at times one vibrating screen would be sufficient, but not to allow for the use of two would be a serious error in the layout of this plant.

TABLE No. III.
FOR DETERMINING THE LENGTH OF SECTIONS FOR THE ROTARY SCREENS

Maximum ring size of feed, inches	Ring size of product, inches	Total tonnage required	Listed capacity per foot of length, tons	Theoretical length of sections required, feet	Practical length of each section, feet
Screen No. 1 and No. 2—Each Fed 133 Tons					
3½	2½	61	4.5	13.5	16
6	3½	86	5.8	15.0	18
6	4	14	6.3	2.3	6
Screen No. 3—Feed 122 Tons					
1	⅝	23	3.0	7.7	14
2½	1	46	4.0	11.5	16
2½	1½	26	5.5	4.8	8
Screen No. 4—Feed 78 Tons					
1	⅝	26	3.0	8.7	14
2½	1	43	4.0	10.8	16
2½	1½	23	5.5	4.2	8

The principal equipment required for the crushing plant only is listed in Table No. IV with the approximate horsepower required for each machine. It will be noticed that the power requirements for the principal equipment amounts to about 2½ hp. per ton of material handled per hour. This is a trifle less than the requirements as given in the two previous layouts, but it again illustrates that approximately the same power is required per ton of material crushed no matter what the arrangement may be.

It will be noticed that the writer has indicated a separate elevator and screen for the fine crusher. This arrangement is desirable for two reasons. It would not be good practice to take the product from this crusher and return it to the original elevator, as it would be merely adding an additional load to each item of equipment and would retard the efficiency of the screens or require a larger diameter screen. As far as the elevator is concerned, while it is true that a separate elevator is another item, it costs a certain amount of money to elevate a ton of material whether this is done in one or two elevators. Another reason for the separate elevator and screen is to allow the closing down of this crusher with its elevator and screen when it is not required to be in operation. The arrangement can be made so that either one of the finishing screens can take the product from the first two screens.

The aim of this article is to illustrate that it does not require a battery of screens to produce a varied size product, but that with a little thought given to the problem even *existing plants* can be greatly benefited by a slight alteration of their present equipment or possible addition of new screens. This layout, while it apparently pertains to a new plant, ought to be of benefit to those operators of existing plants who will soon be called upon to study their present equipment and determine whether or not it is suitable for their requirements for the coming year. While it may seem rather early to mention revamping of plants at this time, the alert manager or superintendent usually knows what his limitations are at the end of the season, and that is the time to consider planning for better production during the next year.

Shale Crushing Efficiency of Hammer-Mill

RECENT experiments carried out at a brick company's plant on crushing shale with a hammer-mill have been reported in the *Journal of the American Ceramic Society*. The mill used in these tests was a 30x42-in. pulverizer, direct connected to a 1200 r.p.m., 100-hp. squirrel cage motor.

The results as found showed that the mill would grind easily and in one operation all chunks of shale containing chert nodules passing through the hopper opening. The energy consumption was comparatively efficient and the maximum capacity of this size mill with hand feeding found to be 56 tons total feed and 42 tons through 6 mesh per hour. This figure, it is said, could have been greatly exceeded with a more rapid feed.

The general conclusion arrived at was that the hammer-mill could be efficiently employed in shale grinding if properly set up.

Portland Cement Manufacture in the Near East

Nesher Portland Cement Co., Ltd., Is Palestine's Largest Industry and Produces Over 300,000 Barrels Per Year

By William Schack

AFTER living a few months in Palestine and witnessing the crudeness of the commercial life of the country, one comes upon the plant of the Nesher Portland Cement Co., Ltd., in Haifa, as some strange and marvellous creation. Here where camels carry a dozen or two dozen bricks all day long to some place where a house is being built, and donkeys amble off with their small sacks of dirt placed saddlewise where a road is being constructed, and peasants come into town with their produce, hanging around until it is all sold, grape by grape or watermelon by watermelon—in such a country a modern factory, even if it were not of so advanced a type as the Nesher, would necessarily seem something of a miracle. Of course, this is all traveller's fancy, and legitimate fancy; but to the officials and personnel of the company it is no different than if it were in Europe or America—a place where production is to be kept at the highest level of efficiency possible and the product kept up to the highest standards possible.

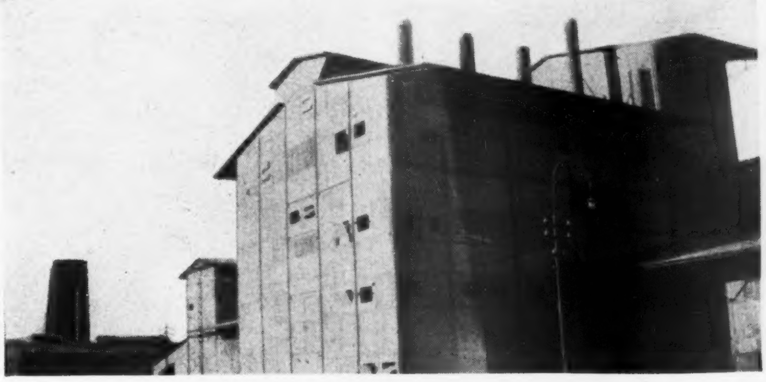
The impetus to the industrial development of Palestine in general is of very recent origin. Before the war the land was, of course, under the Turkish sovereignty, and seems to have been colossally mismanaged. Railroad service was inadequate, such roads as there were were in very poor condition, forests were senselessly cut down, agriculture remained at the primitive level it had dragged along at for centuries, industry was non-existent. It was only when England took over Palestine as a mandated territory and issued the Balfour Declaration in which it pledged itself to foster the development of a Jewish homeland there, that the country began to be vitalized. The last five years saw a great tide of immigration from all parts of Europe. Along with laborers, skilled and unskilled, came people to prospect for industrial possibilities and soon factories, smaller and larger, began to dot the country. A certain group, familiar with the country in a general way, realized that in its hills were good materials for a cement industry. They sent out two investigating parties, which worked independently of one another, with the result that the present site near Haifa was chosen.

Plant Ideally Located

The location is ideal from both an esthetic and commercial point of view. It lies on the Mediterranean (or the Bay of Haifa, a small arm of it) at the foot of Mt. Carmel, which is being developed as a summer resort. Though the harbor is at present inadequate, it will probably be improved before long. Palestine really has no good port at all, and it is a question whether the most extensive harbor improvements shall be made in Jaffa or in Haifa. Though most of the established trade goes on at the old port, the chances are that Haifa will be favored for the future since it is likely to be the big industrial center of the country and because the waterfront is not impeded with buildings as the port of Jaffa is. The Nesher company will then have the advantage of an easy shipping outlet. Besides this convenient location for a water route, the factory is also served well on its land transport since it is on the chief road of Palestine—the Nablus Road. This runs eastward from the coast, then southward to Jerusalem. By means of it Haifa is connected with the new agricultural settlements and villages in the Valley of Esdraelon, where steady building operations may be looked for in the next years. As for rail shipment, the company has a siding on either side of its packing building. One is broad gauge to run on the domestic and Egyptian rails, the other narrow gauge to connect up with the lines running to Syria and Transjordania (Iraq). The plant is thus located to the best advantage under present conditions and to utilize the improved means of transport the future will bring.

Another great advantage of this site is the availability of raw materials, which are literally a stone's throw away. The limestone is obtained from Mt. Carmel, just on the other side of the road passing the plant, while the very land on which it stands supplies the clay. (The approximate composition of these materials will be given further on in the article.) Both are present in such large quantity that there is no need to think of other sources of raw materials for a long time to come.

The entire group of buildings borders a narrow rectangle. As one enters there are on the right hand, successively, the offices, the chemical laboratories, the repair shop, the spare parts storehouse. At the left as one enters there are the cooling tower, followed by the power house and the large main building which houses the mixing machines, the driers, the grinders and the four kilns. The extensive loading room flanked by the sidings lies behind the main building toward the sea. Its silos are fed automatically by a conveyor which is run over an enclosed bridge from the grinders. The cement clinker as it comes from the kilns is stored in large open silos between the main building and the loading room. A crane then carries the clinker to the grinding mills from which the finished cement is passed on to the storage silos. From these the cement is packed as needed by machines into bags and barrels.



Cement plant of the Nesher Portland Cement Co., Ltd., Haifa, Palestine

Some views of the plant exterior and interior are shown here. The main building is built with such economy and compactness that it was impossible to get any satisfactory interior photos of it. It is virtually divided into three parts, the mixing and grinding taking place in the first section, the drying in the second, and in the third the materials are incorporated with a high grade powdered anthracite and shaped into briquettes for

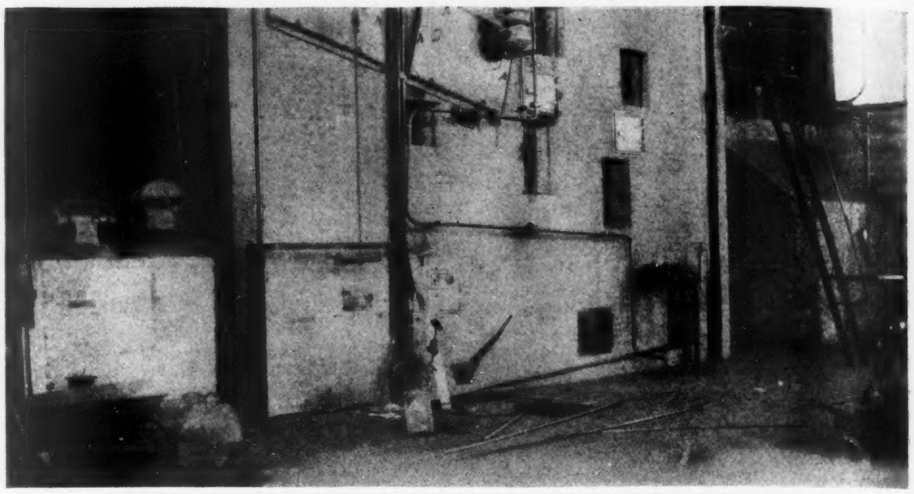
firing in the kilns, also in the same unit of the building. Every bit of the machinery is modern, and the whole plant functions automatically. The machines were not purchased from one or two manufacturers, but carefully selected from various European workshops—English, German, Swedish, Belgian, etc. The power house, furnishing 3,000 hp., is the biggest in all Palestine and is likely to remain so until the Rutenberg project for electrifying the entire country by means of the water power of the Jordan is realized. There are two turbines, one with a capacity of 1,700 k.w., the second of 1,000 k.w. They distribute power to some 70 motors used throughout the plant, varying from one-half to 500 hp. The coal which is used for fuel is imported from England at the present time. The kilns, however, are electrically heated, operating at 1200 deg. C.

The laboratories are neatly housed in a separate building, with one room for an office, two for production control tests and other analyses and two more for preparing blocks for strength tests, testing apparatus, etc.

The building for spare parts is carefully laid out, and complete inventories of the 5,000 items kept here are on hand. The management is only too well aware of the time it would take to get missing parts from Europe, and is taking no chances of running short on them. In the same way, the repair shop has been stocked with the most complete machinery to take care of all damages that are remediable, on the premises. The government railways frequently have repairs made in this shop which cannot be properly taken care of in their own.

Compound grinders are used in pulverizing the raw materials. These long cylinders are placed in the same straight line with the driers, so that no space is wasted.

The machinery for the plant was of course shipped by sea. While the cost was thus kept down, there were tremendous difficulties in landing such heavy things. There are no docking facilities in Haifa. The ship casts anchor at some distance from shore, and large rowboats come up to it to take the cargo. Derricks were not a very common object on the Palestine landscape in those days (nor are they yet), and to take the freight from the rowboats onshore was an enormous job. Nevertheless, the company imported, not only the necessary machinery, but the materials to build the plant itself. For the plant and equipment about three-quarters of the capital of $1,500,000 were expended, or some $1,125,000.



Section of the power house where about 3000 k.w. are generated. This is the largest individual power station in all Palestine

The layout of the entire plant was arranged by a Hungarian chemical engineer, Dr. Spiegel, who supervised the construction as well. Dr. Spiegel was also responsible for perfecting the chemical processes involved. Before the plant was actually finished, every detail in the making of the cement had been studied completely, so that from the very start there have been no difficulties in the production end. Construction of the plant was begun in March, 1924, and it was completed in November of the following year.

It was originally planned to produce some 35,000 tons annually, but since there was a big building boom and a consequent demand for cement, the capacity of the plant was increased. With three shifts working eight hours from the very beginning, production for the first year is estimated at over 50,000 tons, though between 60,000-70,000 tons can be produced if necessary.

The chief market is Palestine and Syria. Of all the cement used in the former country last year, 80% was supplied by the Nesher plant, according to the sales manager, M. Polack. Their chief competitors in the home market are England, Italy and Germany. Since cheaper grades are readily bought by the Arabs, and it is mainly on quality that the Nesher product relies for its sale, this competition was a very serious one. The small import duty laid down by the government (presumably at a time when there was no cement plant in the country) made the competition even greater. However, the company is making rapid headway against this competition, says Mr. Polack, as the larger native builders are coming to appreciate a quality rather than price basis for this commodity.

What makes the sales problem especially difficult, even in the home market, is the high freight rate prevailing. It has been computed that it costs as much to ship from Haifa to Tel-Aviv, about three hours' dis-

Handling raw material at one end of the main building. Note the "shorts" on the laborer at the right—this is a popular costume among young workers

Section of the fine chemical laboratory equipped with modern testing devices. Rigid control of raw and finished materials is one of the features of this plant

tant by train, as from Hamburg, Germany, to Haifa. The railway authorities have been doing very good work in stabilizing and improving service, and in the short few years they have taken over the lines have been able to show a net profit of considerable size. But passenger and freight rates have been pushed up rather high to accomplish this result.

Composition of Materials and Cement

The limestone, which is one of the raw materials, contains about 90% $CaCO_3$, the remainder being chiefly silicates of iron and aluminum. The clay which forms the other constituent is entirely sand-free, an average analysis showing the following composition:

	Per cent
Loss on ignition	19.0
Silica	46.0
Fe and Al oxides	20.0
CaO	10.0
MgO	1.5
SO_3	0.5

The cement itself analyzes, on an average, as follows:

	Per cent
Loss on ignition	2.3
Insoluble residue	0.3
Silica	21.0
Alumina	7.0
Iron oxide	2.5
Lime	64.7
SO_3	1.2

Strength tests have been made by various laboratories aside from their own. The results obtained by the laboratories of Henry Faija of London are subjoined herewith:

NEAT CEMENT

	Lb. per sq. in.
2 days	600
7 days	847

CEMENT MORTAR, 1:3 MIX

	Lb. per sq. in.
2 days	352
7 days	585
28 days	652

These figures exceed by a good margin even the rigorous English specifications.

The company employs some 300 workers, a large majority of whom are Jews. The natives are not employed within the factory, being used chiefly in the mining end of the work. Arab labor can be had a great deal more cheaply, of course, but since the purpose of the enterprise is the development of a Jewish country, the strictly commercial point of view is to this extent departed from. The average wage for an eight-hour day is 32 piastres, or $1.60. While one can hardly wax rich on it, this wage scale is probably a full 100% higher than the average in this and neighboring countries among the natives. The spirit of the workers is very good, especially since they also are actuated by patriotic motives. It may in part be due to the neat, effective layout of the plant that everything seems to function smoothly and in orderly fashion, but the quiet, willing manner of the workers contributes a good deal also to the excellent impression the whole plant makes. The company maintains a workmen's insurance policy and has constructed thirteen two-family houses as well as barracks which it lets out for a small rental.

Prominent names figure among the stockholders of the company. Among them may be mentioned Baron Edmond Rothschild of France, Sir Alfred Mond of England and M. Polack of Russia. The latter was known as the oil king in Tsarist days; he is president of the firm. Upon completion of the plant, Dr. Spiegel went back to Europe, and his place as technical director was taken by the German engineer, E. W. Stoll. The chemical laboratories are in charge of G. Ashkenasi.

The significance of the Nesher plant extends far beyond the field of cement. As the largest industry in the new Palestine thus far, solidly built and efficiently managed, it is an encouragement for other industrialists to venture into a country that was all but inaccessible a dozen years ago and that yet has serious difficulties by reason of its situation and untoward neglect for centuries.

Belgian Cement Makers Protest

Editor of Rock Products:

WE have read with much surprise in your August 21 edition the article reproduced from *Roads and Streets* entitled 'A Menace to the Portland Cement Industry.' We very much regret the tendency shown therein to close your frontiers to one of the products of our industry.

The very data given in this article shows how much its title is exaggerated as it reveals that the total amount of cement imported into the United States represents only 1.27% of your consumption. Which of our Belgian industries would not be pleased to know that foreign competition amounted to a menace of 1¼% only?

But in order to fully appreciate this very important question, let us consider, not one isolated industry, but the whole of our exchanges with your country. In 1925 Belgian exports to the United States amounted to 1,112,893,411 francs, whilst our imports from United States reach a total value of 2,183,937,270 francs, that is, nearly twice as much. And the United States still finds our share too large!

Moreover, if your borders are closed to our export products, how do you suppose we could possibly pay for the wheat, cotton, petrol and oil, machinery, from steam engines and agricultural machines to typewriters and motor cars, which we purchase at yours. Of the latter only we imported during 1925, 127,021,644 francs worth whilst the value of our cement exported to the United States amounts to 54,279,290 francs. And yet we are, just like you, manufacturers of steam engines and motor cars.

Our finances were ruined on account of the war and, in order to improve them we would be quite justified in levying duties on the various commodities we import. But we have never yet thought of excluding the foreign manufacturer from our inland market and in our customs tariff you will find no prohibitive duties.

All we want is *fair play* which has always been our rule. Nevertheless we were often unjustly accused as, for instance, two years ago, when some American cement manufacturers suspected us of using dumping practices. On the strength of this accusation your consular agents made exhaustive inquiries over here, your customs officers investigated our books, and they had to conclude that their suspicions were unfounded.

At present you are making insinuations respecting the irresponsibility of foreign cement manufacturers and the risks that exist in cement structures where the cement lacks the proper strength. We do not consider this fair play.

We can positively guarantee our cement not only to comply with the requirements of your standard specifications but to far exceed them. Moreover, are we not submitted to your laboratories' control? All our cement exported to your country is tested according to the rules laid down in A. S. T. M. specifications, not only at our works laboratories, but also at the offices American laboratories possess in London or on the Continent. Even the recent manual of cement testing issued by your A. S. T. M. in order to render cement testing more uniform has been carefully translated and enforced in our laboratories.

Since 1925 all Belgian cement manufacturers have grouped themselves to constitute a Professional Association whose members have decided to accept a severe control on all exported cement. This Association owns within the premises of the Brussels University a laboratory ranging amongst the world's best equipped. This laboratory is under the supervision of a learned scientist long since specialized in the study and testing of cement and concrete.

Any portland cement manufactured by one of the affiliated works and submitted to the regular control of this laboratory, can, on leaving our country, testify to this element of security by appending the Association's countermark, which we reproduce hereunder.

This mark means that Belgian manufacturers are quite willing to assume the full responsibility of their deliveries and any unbiased observer will own that all cements bearing same can fearlessly stand comparison with the best.

We thank you beforehand and remain,

Cimenteries et Briqueteries

Reunies S. A.

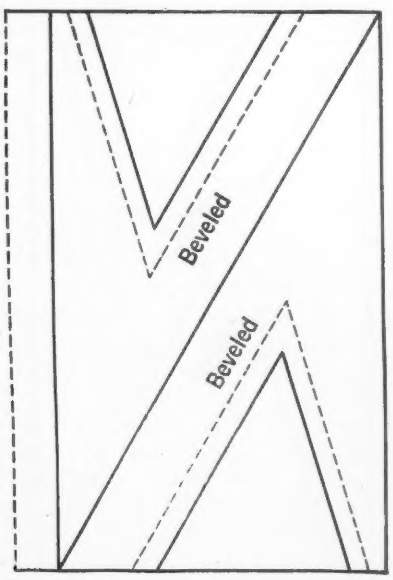
F. Van Ortroy, Secretary.

Antwerp, October 19, 1926.

Hints and Helps for Superintendents

Capping Worn Dipper Teeth

AN interesting application of oxwelding in reclaiming worn dipper teeth is described in a recent issue of *Oxy-Acetylene Tips.* The method as carried out by an Eastern welding concern might easily be adopted by rock products operators, for all it requires is a welding apparatus and rods.



Layout for cutting points from tire

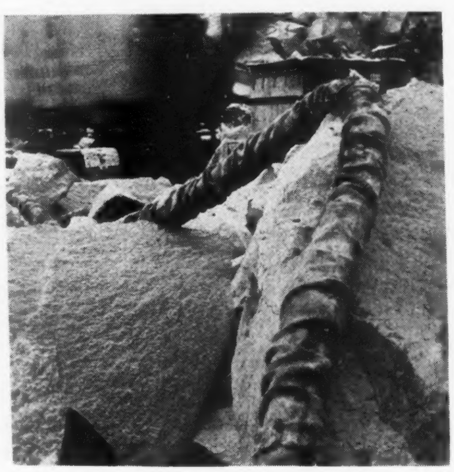
The material used for reconditioning the worn parts comes from the scrap pile in the form of old locomotive tires which are readily obtained at low cost from any railroad yard. These tires are hard and tough, and quite resistive to wear, being of high quality carbon steel. The teeth are laid out as shown in the sketch. By accurately cutting from this pattern, two teeth can be made from the tire at the same time and but little finishing is necessary. After cutting, the curve (due to the tire) is hammered out straight and the piece is ready for welding to the old tooth.

The accompanying cut shows the worn tooth with the new tip, before and after welding. Note that the new point is of solid steel and has been designed so that the strain in operation will be borne only partly by the weld.

The entire shop operation takes about 1½ hr. The teeth, after capping, are said to give service quite comparable to the original and they may be resharpened on the anvil whenever necessary. About 1½ lb. of Norway iron welding rod is used in welding the new point to the old tooth, which is ordinarily of manganese steel.

Electric Cable Protection

WITH the increasing use of electrically driven quarry equipment such as well drills and shovels, the problem of the lead-in cable becomes more general. Even the best protected cable is not proof against wear and cuts when continually shifted over sharp, jagged and abrasive rocks.



Old fire hose makes good cable protection

Wearing through of the insulation is not only endangering to the power supply, but is a serious hazard to the men employed in the quarry, especially in wet weather, when a workman may get a fatal shock from merely stepping in a puddle of water through which a defective cable is laid.

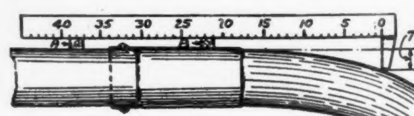
This problem of protecting the electric cable has been solved in an unusual way at the plant of the Lynn Sand and Stone Co., Swampscott, Mass. Old fire hose, ordinarily condemned as practically worthless, is purchased from nearby towns and cities. It has been found that this furnishes not only a cheap, but very effective protection to the cables, with waterproofing and insulating properties of its own.

Measuring a Dredge Discharge

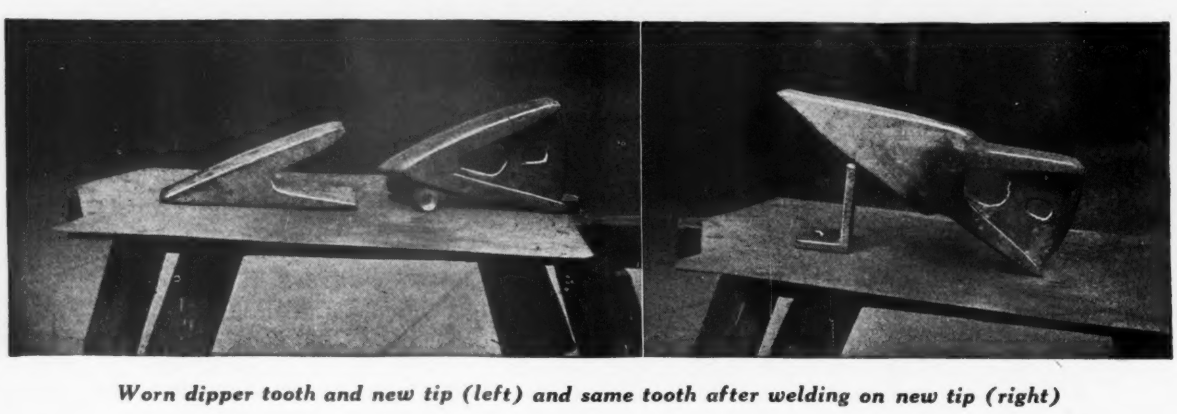
THE following is from an article on the "Design and Operation of Dredges," by William Gerig, U. S. Army Engineer, in the August issue of *Engineering and Contracting.*

"A simple and quite accurate method of measuring the velocity in the discharge pipe is with a velocity-measuring device, as shown in the figure. If the discharge pipe at the end where the measuring is done is in good condition, the velocity can be obtained with an accuracy within one per cent.

"Place two blocks near the end of the discharge as shown at *A* and *B*. The top surface of the blocks must be in line with the inner surface of the outer lap of the pipe. Make a straight edge with off-set of 7¾ in., plus the distance from the inner surface of the pipe to the lower face of the straight edge. Graduate the straight edge with five subdivisions per linear foot, the zero being opposite the inner face of the off-set. Slide the straight edge back and forth until the off-set just touches the upper surface of the water discharged, and the velocity in feet per second may be read directly, by taking the subdivision opposite the end of the pipe. In the figure, the velocity of discharge is 17.8 ft. per sec. Slight variations in the inclination of the pipe are negligible. The curve of the water is a parabola and the accuracy of the device can be deduced mathematically."



Device for measuring velocity of a dredge discharge

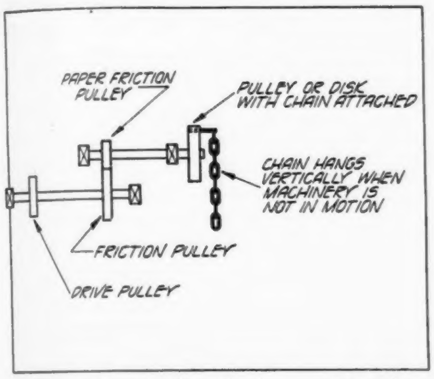


Worn dipper tooth and new tip (left) and same tooth after welding on new tip (right)

Bin Agitating Device

AT the recent National Safety Congress in Detroit, Mich., there was a most interesting discussion by cement mill and quarry superintendents on accident prevention. The subject of bin accidents was incidentally brought up. It was brought out in this discussion that the most fruitful source of fatal accidents in the cement industry, during the period that statistics have been kept, is in cleaning out bins that hang.

Men repeatedly go into bins of both raw material and finished cement to bar or pole down material that bridges or arches over the discharge opening. The use of life-lines



Plan of agitating device on top of screening bin

and an attendant is imperative as an ordinary safety precaution. But even the use of life-lines and attendant have not prevented men from being buried and suffocated by sudden cave-ins.

The question was finally raised, why send a man into any bin to start the material moving? The use of compressed air jets is common at many plants for loosening the material and making it flow. Compressed air is very effective with fine, dry materials such as finished cement; it will also work well with pulverized limestone. But in the case of caked or frozen raw materials such as crushed stone, or limestone screenings, compressed air jets are not effective.

A specific example of the danger involved was mentioned by the chairman of the quarry section meeting, E. E. Evans, of the Whitehouse Stone Co., Toledo, Ohio. He said their screenings bin was frozen or crusted over, and a green employee sent to loosen the material, without first trying the material with a pole, jumped into the bin. The only thing that prevented his being buried and suffocated was the fact that the bin gate happened to be open and he went on through and was revived.

Such accidents are fairly common, or at least the hazard is a common one. And there is a way to avoid this hazard. J. W. Hawk, master mechanic, France Stone Co., Toledo, Ohio, described a device he has originated, which makes it unnecessary for their men to go into a screenings or stone bin. His device aroused more active interest among the superintendents at the meeting than any other one thing mentioned. For the benefit of those who were not at Detroit we illustrate Mr. Hawk's device herewith.

He says it can be built out of scrap materials around any plant. The device consists of three pulleys and a round disk, cam or pulley. The device is mounted over the top of any bin, and the drive pulley is belt-driven from any available shaft. The size of the various pulleys will, of course, depend on the speed of the pulley or shaft which does the driving. As the device is only used occasionally, there is no call for efficiency or beauty.

The driven pulley is mounted on a short shaft to which is attached at the other end a friction pulley. This friction pulley drives another shaft through a smaller pulley. This is merely to increase the speed of the second shaft. There would be no need for the second shaft if the first could be driven at the proper speed to produce the required results as described later. The speed is determined by the size of the bin and the results to be obtained, and is somewhat a matter of experiment in each case.

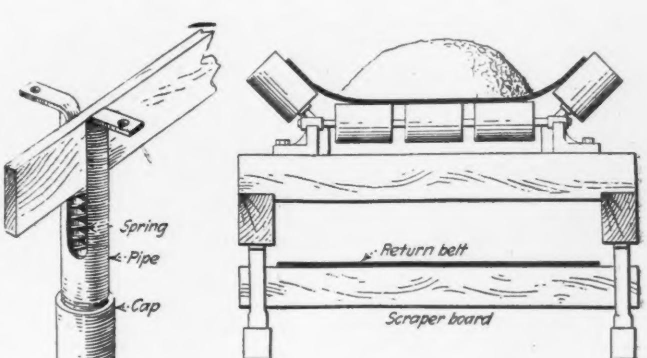
On the end of the second driven shaft is a disk, or pulley, with a projecting pin or crank. To this is attached a heavy chain—an old steam shovel chain answers very well. The chain hangs vertically in about the center of the bin when the machinery is at rest. When the disk to which the chain is attached is revolved, the chain whips about the interior of the bin and cleans it better and more quickly than a man inside could do it. The chain is too heavy to whip around on the radius of the revolving disk; it is simply agitated in every conceivable direction. The speed is 25 r.p.m.

The details of construction can doubtless be varied in as many ways as the plant superintendent wishes. The idea is simple—just agitate a heavy chain which hangs near the center of the bin. Then it will never be necessary to send men into the bin.

Cleaning Conveyor Belts

MATERIAL from the quarry or pit contains more or less fine material which is apt to accumulate on the surface of the belt conveyor used to haul this material to the washing plant. Although a part of this accumulation is discharged along with the unwashed sand, gravel or rock, some of it remains on the belt and is distributed along the runways. A simple device used at an El Paso smelter to remove this accumulation (in this particular case, the result of soft clayey ores) is described in *Engineering and Mining Journal.*

This company places scraper boards under the return belt near the discharge end for the purpose of cleaning the belt as much as possible. These consist of a ½-in. board, 4 in. in width, held in two supports and pressed against the return belt by springs. The weight of the belt causes it to scrape over the board, clearing itself. The accompanying illustration shows in detail the arrangement.



Scraper boards for cleaning conveyor belts

Rock Cracker Saves Powder and Drilling

THE expense of breaking pieces of moderate size, but too large to be loaded by a steam shovel in a quarry, may often be lessened by using the device shown in the cut. It is a ball of cast iron about 2 ft. 6 in. in diameter. In using it the steam shovel picks it up as it would pick up a rock. The dipper is then swung over the piece which it is desired to break and the bottom opened so that the ball falls from it. The higher the dipper can be held the greater the blow delivered by the ball.

Cast iron ball cracks rocks

A ball 2½ ft. in diameter made of cast iron would weight about 3¾ tons. Dropped from a height of only 5 ft. it would strike with a force of 126,500 ft. lb., which is enough to crack a fair sized rock to pieces. Such a method is quicker than "mud capping" or putting in a pop shot beside being cheaper.

A similar device has been used around smelters for many years for breaking the "skulls" that are left in a slag ladle after pouring. For this reason such a ball is usually called a "skull cracker."

Direct Production Costs of Broken Stone*

A Study of Costs in Quarries of Different Types Carried on by the Bureau of Public Roads

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THERE are no available sources of information as to the direct costs of producing broken stone which are satisfactory for comparative purposes by quarry operators. Something can be found in cost data manuals on certain operations, but the material is scattered and unsatisfactory because the conditions under which the operations were conducted are usually not stated.

Some time ago the Bureau of Public Roads undertook a study of quarries and broken stone production, especially direct costs and conditions governing them. It was decided not to enter the field of overhead costs, which vary largely at different quarries and in different localities, and the following items also were omitted from the study: Capital investment, interest, royalties, general repairs, insurance, depreciation, depletion, opening of quarry face, general supervision, accounts, sales, and delivery. This reduced the investigation to a study of the direct production costs, which included only such supervision as that employed directly in quarry or plant.

Different types of quarries, pit and open-face, high and low-face, and large and small plants operating in various kinds of rock were selected for study, and all conditions were noted that might affect costs. As it was desired to make the results of practical value at any time, quarry methods of operation, wage rates, costs of material and labor hours, as well as dollar costs per unit, were recorded. Since the results are given not only in terms of dollars but also in terms of labor hours and materials, they should be of permanent value to quarry operators and all others engaged in rock excavation.

*Public Roads, October, 1926.

Method of Study

The operation of producing broken stone was divided into ten natural units as follows: Stripping, drilling face, drilling boulders, blasting face, blasting boulders, sledging and steel balling, pumping, loading and hauling waste; loading and delivery to crusher; and crushing, screening, etc.

The data were acquired by daily visits to selected quarries for a period usually of eight weeks. Payrolls and books, where kept, were consulted and all results were checked by personal observation. Methods of operation were studied and the rock being quarried was sampled for laboratory tests to determine its nature.

A complete report on these studies, giving a description of each of the 23 quarries studied, with data collected at each and comparisons of operations at the various quarries, is to be published, but it is considered worth while to present at this time some of the comparisons and conclusions. The various items will be discussed in the order listed above. In studying the data presented in the different tables it may be desirable to know the scale of operation of the different quarries which are referred to by key numbers, and this information is given in Table 7.

Discussion of Operating Costs

Stripping.—Stripping was conducted at 14 of the 23 quarries. At the others there was either no stripping or so little that it was shot down with the face and eliminated in the screening operation. At the 14 quarries where stripping was done the cost varied from $0.0022 to $0.0873 per ton of broken stone. With one exception all stripping was removed by hand labor and dump carts.

Drilling Face.—Table 1 summarizes the data on face drilling. It should be noted

TABLE 1.—*Drilling face data* [1]

Quarry key No.	Kind of rock	Kind of drill	Direct cost of drilling face per ton of broken stone	Cost per foot drilled	Average feet drilled per hour per drill	Tons down per foot drilled	Factors affecting results
18	Diabase (trap)	Tripod	$0.0247	$0.80	1.81	69.09	High face, numerous joint planes, tripods, snake holes, electricity, air.
8	Dolomite	Well	.0250	.68	1.29	27.24	High face, well drills, deep holes, far apart, electric power.
[2] 17	Diabase (trap)	do	.0264	2.06	.65	53.47	High face, well drills, hard rock, deep holes, far apart, steam power.
21	Limestone	do	.0273	.53	3.10	19.23	Medium high face, well drills, soft rock, holes far apart, electric power.
20	Dolomitic limestone	do	.0308	.74	2.48	24.53	High face, well drills, soft rock, holes far apart, gasolene power.
7	Siliceous dolomite	do	.0375	.94	.80	25.15	Do.
22	Marble	Tripod	.0470	.40	([3])	8.51	High face, tripods, soft rock, snake holes, electric power, air.
19	Diabase (trap)	do	.0487	1.57	1.61	32.25	High face, tripods, hard rock, snake holes, electric power, air.
23	Slate	Well	.0596	1.43	.91	24.09	High face, well drills, hard rock, snake holes, steam power.
3	Granite	do	.0819	1.83	1.68	18.70	High face, well drills and tripods, hard rock, oil and electricity.
10	Diorite (trap)	Tripod and well.	.1167	.76	1.20	6.48	High face, well drills and tripod (mostly), hard rock, electricity, air.
12	Altered rhyolite (trap)	Tripod	.1323	.69	2.34	5.19	Low face, benches, medium hard rock, hole spacing close, electricity, air.
15	Trachytic rhyolite (trap)	do	.1835	.42	4.13	2.31	Low face, benches, tripod, medium hard rock, hole spacing close, steam
6	Conglomerate	do	.1845	.45	4.39	2.45	Low face, benches, tripod, medium hard rock, hole spacing close, electricity, air.
14	do	do	.2382	.95	2.54	4.00	Low face, benches, tripod, medium hard rock, hole spacing close, steam.
1	Granite	do	.2384	.87	2.05	3.68	Low face benches, tripod, very hard rock, hole spacing close, electricity, air.
5	Rhyolite conglomerate	do	.2509	.64	3.73	2.53	Low face, benches, medium hard rock, hole spacing close, steam.
11	do	do	.2667	.62	2.49	2.83	Do.
4	Granite	do	.2685	1.57	1.96	5.82	Low face, benches, tripod, hard rock, hole spacing close, steam.
9	Diorite (trap)	do	.2692	.54	3.05	2.36	Low face, benches, tripod, very hard rock, hole spacing close, steam.
13	Andesite (trap)	do	.4060	1.35	1.53	3.32	Low face, benches, tripods, very hard rock, some snake holes, spacing close, steam and electricity.
16	Rhyolite (trap)	do	.4358	2.18	.81	4.99	Low face, benches, tripods, very hard rock, spacing close, steam and electricity, steam and air.
2	Granite	do	.4482	.60	2.88	1.34	Low face, benches, tripods, very hard rock, spacing very close, steam and electricity, air.

[1] See Table 3 for spacing of holes.
[2] Snake holing with tripods also at this quarry cost $1.06 per foot, and averaged 1.34 feet per hour per drill.
[3] Undetermined.

that low cost per foot of drilling does not necessarily mean low cost of drilling face per ton of broken stone on account of wide differences in the spacing and depth of holes, and the combination of snake holing with vertical holes.

The average rate of drilling per hour was 2.4 feet for tripod drills and 1.46 feet for well drills. Comparison of rates of drilling with the laboratory results of the wear test indicates a relation between them which should be useful in estimating on rock drilling. Table 2 gives data on the rate of drilling and the percentage of wear of the rock for the different kinds of drills.

Table 2.—*Relation between average feet drilled per hour by different types of drills and percentage of wear of rock as determined by laboratory test*

Tripod drills (vertical holes)			Tripod drills (snake holes)			Well drills		
Quarry key No.	Average feet drilled per hour	Per cent of wear	Quarry key No.	Average feet drilled per hour	Per cent of wear	Quarry key No.	Average feet drilled per hour	Per cent of wear
6	4.39	5.0	19	1.68	3.0	20	2.48	6.2
15	4.13	3.1	17	1.34	2.7	21	3.10	5.4
9	3.05	2.9	18	1.81	2.0	8	1.29	3.1
2	2.88	2.7				17	.65	2.7
12	2.34	3.0				7	.80	2.6
16	1.53	2.0						

At the time the studies were made little or no use was made of hammer drills in face work, although they were used in plugging boulders. New types of hammer drills are now on the market and are widely used for bench work. They require only one man for operation and drill at a much faster rate than tripod drills. They are most successful when operated by air.

Blasting Face.—Detailed data on blasting operations are shown in Table 3, in which the quarries are arranged in the order of the cost of blasting the face per ton. The highest costs were in connection with bench work in hard rock with few joints or with high faces in much jointed rock where snake holes were used. Some high costs resulted from wide spacing of vertical well-drill holes in high faces. Low costs would be expected in the large quarries, but occasionally a small quarry is found in the low-cost group and a large quarry in the high-cost group.

The kind of rock, differences in joints, hole spacing and height of face were important factors affecting costs, but poor blasting often resulted in the need of further blasting for the removal of spurs and toes. Much blasting in small quarries was found to be haphazard or experimental.

Analysis showed that the tonnage brought down per pound of dynamite is but slightly related to number and spacing of drill holes. In this respect there is a great difference between the operations of large and small producers. In the item of tonnage brought down per foot drilled, which is of much greater importance, the results were much more satisfactory in the quarries classified as large and very large from the production standpoint than in those classed as medium, small and very small. There were conspicuous exceptions to this, however.

It is concluded that there is a decided advantage in using deep, well-drill holes, widely spaced, or if the face is high and much jointed, snake holes should be used. The ten quarries with the lowest combined cost of drilling and blasting face used one of these two methods. Cost of the two items is not necessarily affected by production volume, as the quarries ranking highest and lowest in this cost had about the same output.

Steel-Balling the Most Satisfactory Method of Boulder Breaking

Boulder Breaking.—So many factors enter into boulder-breaking costs that generalizations are difficult to make and the conditions at each quarry, as given in Table 4, must speak for themselves. The factors affecting the cost are efficiency of management, size of crusher opening, method of loading, drill-hole spacing and blasting, and the character of the rock itself. Illustrating the wide range in conditions, it will be noted that at quarry No. 23 there was no boulder breaking, while at No. 1 the cost amounted to more than 52 cents per ton of broken stone produced.

While it is difficult to give general conclusions, the studies do indicate that the breaking of boulders by the steel-ball method can be used in many quarries to advantage. With this method one or more derricks operated by three-way hoisting engines are placed at a convenient distance from the face and by means of a chain and cable boulders too large for sledging are dragged from the face and arranged beneath the derrick. The derrick is used to lift a steel ball weighing about 2 tons to a height of from 40 to 70 ft. and drop it on the boulder.

Great variation was observed in the success of this operation, but where skillfully directed it was considered very successful. Comparing the cost of boulder breaking at two small-scale quarries, where steel-balling was not used, with three as nearly similar quarries as it was possible to find where steel-balling as best practiced was used, it was found for the former that the cost of breaking boulders per ton of broken stone averaged 26 cents, while at the latter it averaged 14 cents.

At medium and small-scale quarries the derricks used for steel-balling may also be used for transporting stone to the crusher and thus lower the cost of this item. If the distance is small, low scale boxes may be loaded and swung directly to the crusher, while if it is great they may be used for dumping into tram cars.

[The use of a cast iron or steel ball with a steam shovel for boulder-breaking is described in the Hints and Helps department of this issue.—Ed.]

Pumping and Disposal of Waste—These operations were so unusual that they did not enter materially into the production cost, with one exception. In the pit-type quarries open seams permitted the escape of water except at one quarry where pumping cost $0.0256 per ton of broken stone. At only two quarries was it necessary to remove waste from the quarry floor. At one of these the cost was a fraction of a cent per ton of broken stone, while at the other it amounted to 12 cents. At the latter quarry, stripping often slid to the quarry floor and clay seams occurred between the beds of marble.

Dump Cart Delivery Expensive

Loading and Delivery.—Loading and delivery have been considered together because a loading method must take into consideration the method of delivery. Methods of delivery varied widely in detail, as would be expected in a series of plants selected because of varying conditions. Among the simplest methods were direct swing and hoist derricks, one-horse dump carts, tram cars pushed or coasted down grade to the crusher, direct cable haul to the crusher, and gasoline and steam locomotives. Numerous combinations of methods were found, most of which resulted from the problems of pit-type quarries. Table 5 shows the methods and costs of these operations at the various quarries.

In the item of loading it appears that many quarries could effect a considerable saving by a change of methods. It was found that a low receptacle could be loaded about twice as fast as a high one. Five quarries using high dump carts loaded at a rate of 2.6 tons per hour per man, two using high tram cars loaded at a rate of 2.5 tons per hour, while two using low-scale boxes loaded at a rate of 5 tons per hour. Assuming the same wage rate at all of the quarries, the respective costs per ton were 21 cents, 20 cents and 10 cents. Loading at five quarries using power shovels averaged 6 cents per ton, the range being from 4 to 9 cents.

Loading by contract labor was done at four quarries and was much more efficient than day labor. The contract labor averaged 3.3 tons per hour, while the average for eight quarries using day labor was 2.6 tons per hour. In both groups the material was loaded into high tram cars and dump carts.

There was found to be a wide range in the cost of delivery, which demonstrates that some of the quarries were using poor methods, although some of the high rates could be attributed to adverse conditions.

TABLE 3.—*Blasting face data, and direct costs arranged in order, from lowest to highest*

Quarry key No.	Direct cost of blasting face per ton of broken stone	Spacing of holes	Height of face blasted	Rock down per pound of dynamite	Rock down per foot drilled	Kind of rock and conditions
				Tons	*Tons*	
18	$0.0227	Snake holes 28 feet in	150 feet	12.9	69.09	Diabase, hard, very greatly jointed.
20	.0412	15 feet apart, 20 feet back	42 feet	4.9	24.53	Limestone, moderately jointed.
8	.0425	12 feet apart, 20 to 25 feet back	60 to 90 feet	5.8	27.24	Hard dolomite, strata slightly jointed, high face.
14	.0440	6 feet apart, 8 feet back	Benches, 18 to 20 feet	10.5	4.00	Rhyolite breccia, well jointed.
19	.0440	Snake holes 30 feet in	150 feet	6.6	32.25	Diabase, hard, highly jointed.
17	.0441	24 to 30 feet apart, 30 to 35 feet back	20 to 30 feet	6.7	[1] 53.47	Diabase, hard, many joints.
21	.0527	12 to 15 feet apart, 20 feet back	20 to 35 feet	3.9	19.23	Limestone, moderately jointed.
4	.0560	5 to 7 feet apart, 6 to 8 feet back	Benches, 14 to 18 feet	8.1	5.82	Granite moderately jointed.
12	.0574	3 to 4 feet apart, 18 feet back	Benches, 20 feet	8.0	5.19	Metamorphosed rhyolite, hard, many joints.
11	.0595	4 feet apart, 8 feet back	Benches, 14 feet	9.7	2.33	Hard conglomerate, well jointed.
5	.0609	5 to 6 feet apart, 15 feet back	Benches, 10 to 18 feet	7.3	2.53	Hard conglomerate, many joints.
7	.0616	12 feet apart, 20 to 25 feet back	70 to 90 feet	3.9	25.15	Hard dolomitic limestone, well jointed.
6	.0619	5 to 6 feet apart, 15 feet back	6 to 18 feet	6.2	2.45	Hard conglomerate, numerous joint planes.
16	.0630	4 feet apart, 6 to 8 feet back	Benches, 15 feet	5.4	4.99	Altered rhyolite, greatly jointed.
1	.0690	5 feet apart, 6 to 8 feet back	Benches, 20 feet	7.0	3.68	Hard granite and porphry, few joint planes.
3	.0794	10 feet apart, 20 feet back	60 feet	5.5	18.70	Granite, moderately jointed.
22	.0800	Snake holes 16 to 22 feet in	75 to 150 feet	6.0	8.51	Marble, hard, fairly jointed.
15	.0886	4 feet apart, 8 feet back	16 feet	5.1	2.31	Trachytic rhyolite, numerous incipient joints.
9	.0913	5 feet apart, 8 feet back	Benches, 20 feet	5.5	2.36	Hard and tough diorite, tight and few joints.
23	.0913	24 feet apart, 20 feet back	75 feet	2.2	24.09	Slate, very greatly jointed.
13	.0968	3 to 4 feet apart, 18 feet back	Benches, 18 to 20 feet	4.1	3.32	Altered andesite, hard, joints few and tight.
2	.1016	3 to 5 feet apart, 2 to 10 feet back	Benches, 20 feet	3.4	1.34	Hard granite, and porphry, few joint planes.
10	.1389	6 to 8 feet apart, 8 feet back	do	3.0	6.48	Diorite, hard and tough, relatively few joints.

[1] Includes well-drill holes and snake holes.

TABLE 4.—*Showing bowlder-breaking methods and costs per ton of broken stone produced*

Quarry key No.	Initial crusher size	Methods of breaking	Direct cost of drilling bowlders	Direct cost of blasting bowlders, mud capping, and block holing	Direct cost of steel balling bowlders	Direct cost of sledging bowlders	Direct cost of breaking bowlders, all methods	Average daily production in tons	Remarks
1	No. 5 gyratory	Block holing and sledging	$0.0714	$0.0827	None.	$0.3727	$0.5268	172	Granite, many bowlders, few fracture planes.
2	Two No. 5 gyratory independent units.	do	.1204	.0392	None.	.3149	.4745	260	Same quarry as key No. 1, following year, fewer bowlders due to change of method of blasting.
3	Jaw opening, 10 by 20 inches.	Steel balling and sledging	None.	None.	$0.0513	.0691	.1204	176	Well managed.
4	do	Mostly steel balling and sledging.	.0330	.0037	.0687	.1374	.2428	125	Same quarry as key No. 3, following year. Owner-manager sick, wages higher, labor much less efficient.
5	Two jaw crushers, 10 by 20 inches.	do	.0010	.0003	.2394	.2506	.4913	73	Very poor management and supervision.
6	No. 6 gyratory	do	.0003	.0002	.0175	.1517	.1697	292	Same as key No. 5, following year, good supervision.
7	Five No. 6 and one No. 4 gyratories.	Mostly mud capping; some block holing.	.0099	.0770	None.	None.	.0869	1,454	Large-scale operation, steam shovel to handle rock, large initial crushers.
8	Five No. 6 gyratories	Block holing and mud capping.	.0245	.1272	None.	None.	.1517	770	Do.
9	Jaw opening, 36 by 42 inches.	All block holing	.0514	.0184	None.	None.	.0698	234	Rock broke well on blasting face, fewer bowlders, large initial crusher, steam shovel.
10	No. 8 gyratory	Block holing and sledging	.0430	.0261	None.	.1627	.2318	532	Bowlders very tough but labor wasted in operation of sledging.
11	Jaw opening, 10 by 20 inches.	Steel balling, block holing	.0216	.0035	.1392	.2427	.4070	66	Inefficiency conspicuous, cost of steel balling and sledging much too high.
12	No. 6 gyratory	Steel balling and sledging.	None.	.0009	.0487	.0939	.1435	214	Bowlders very tough.
13	Jaw opening, 16½ by 29 inches.	Block holing and sledging.	.0284	.0201	None.	.0847	.1328	170	Numerous incipient fractures in bowlders, hence sledging cost low.
14	Jaw opening, 14 by 21 inches.	Mostly steel balling and sledging; some block holing.	.0196	.0024	.0945	.1804	.2969	82	Inefficiency, costs of steel balling and sledging too high.
15	do	Sledging	None.	None.	None.	.2501	.2501	86	No bowlder blasting permitted (city ordinance), hence every large bowlders broken by sledging, and cost of that item high.
16	Jaw opening, 36 by 18 inches.	Sledging and steel balling	None.	None.	.0073	.2063	.2136	180	Small bowlders hard to break, hence sledging cost high.
17	Jaw opening, 48 by 72 inches	A little mud capping	None.	.0097	None.	None.	.0097	1,820	Large-scale plant, large initial crusher, steam shovel for loading, hence low costs.
18	No. 7½ gyratory	Very little bowlder breaking; mud capping.	.0047	.0113	None.	.0006	.0166	264	Rock broke well on blasting, relatively few bowlders, relatively large initial crusher, steam shovel for loading.
19	Jaw opening, 48 by 59 inches.	do	.0029	.0108	None.	None.	.0137	600	Do.
20	Jaw opening, 48 by 60 inches.	A little mud capping and block holing.	.0084	.0273	None.	None.	.0357	1,977	Conditions similar to those at key No. 17, see above.
21	Nos. 10, 9, and 8 gyratories.	do	.0093	.0171	None.	None.	.0264	1,772	Do.
22	No. 6 gyratory	Block holing and mud capping.	.0565	.1140	None.	.1351	.3056	176	Too many bowlders, due to blasting method.
23	No. 7½ gyratory	None	None.	None.	None.	None.	None.	94	Many joint planes, rock finely broken on blasting, hence no bowlders.

The lowest cost of delivery, $0.0229 per ton, resulted from coasting tramcars of 6-ton capacity an average distance of 200 feet down a gentle slope and returning the cars to the face by two men. The second lowest cost, of $0.0328 per ton, was incurred at a quarry where tramcars of 6-ton capacity were hauled to the crusher by a hoisting engine operating a cable a distance of 300 ft. up a gentle grade which permitted a gravity return. Dumping was automatic. The third lowest cost resulted from gasoline-locomotive delivery of tramcars of 2-ton capacity a distance of 300 ft. down a gentle grade. The average cost of delivery at six quarries by one-horse dump carts an average distance of 262 ft. and in general slightly upgrade was $0.1506, or about five times the average for the three quarries mentioned.

The average cost of delivery by steam locomotives over distances ranging from 2300 to 3000 ft. was $0.0645 per ton. At pit-type quarries where steam locomotive hauls of 800 to 2000 ft. were combined with incline hoists the average cost per ton was $0.0672.

The use of the derricks used in steel balling for lifting and swinging scale boxes loaded with stone to the crusher platform

TABLE 5.—*Loading and delivery data*

Quarry key No.	Type of quarry	Average daily production in tons	Cost of loading per ton	Tons loaded per labor hour	Loading, common labor, rate per hour	Method of loading	Cost of delivery per ton	Cost per day, horse, cart, and driver
1	Open face	172	$0.1866	2.5	$0.45	By hand into high-sided tramcars	$0.0862	
2	do	260	.2056	2.5	.50	do	.1758	
3	do	176	.1235	4.6	.50	By hand into low-scale boxes resting on ground	.1283	
4	do	125	.0797	6.0	.50	do	.1347	
5	do	73	.2010	2.67	.50	By hand into high dump carts	.2071	$5.50
6	do	292	.1284	[1] 4.0	.50	By hand into low-scale boxes resting on ground	.0740	
7	Open face and pit	1,454	.1041	3.4	[2] .30	By steam shovel mostly, part by contract, hand labor	.0505	
8	Open face	770	.1667	3.2	[2] .30	By hand into tramcars, by contract, hand labor	.0667	
9	do	234	.1409		.39	Steam shovel to tramcar	.0328	
10	do	532	.0976		.44	Steam shovel and hand labor into low tramcars	.0382	
11	Pit	66	.2443	2.27	.50	Mostly by hand into high dump carts	.1251	[3] 4.50
12	Open face	214	.1521	3.05	.44	do	.1186	5.50
13	do	170	.2202	2.29	.45	do	.1301	5.00
14	do	82	.2040	2.7	.50	do	.1445	5.25
15	do	86	.3280	1.4	.42	do	.1784	5.40
16	Pit	180	.1788	2.9	.50	By hand into low-scale boxes resting on ground	.1459	
17	Open face	1,820	.0535		.40	Steam shovel	.0664	
18	do	264	.0902		.43	do	.0229	
19	do	600	.0729		.40	Electric shovel	.0376	
20	Pit	1,977	.0462		.50	Steam snovel	.0838	
21	Open face	1,772	.0538		.50	do	.0627	
22	Pit	176	.1294	3.5	[2] .50	By hand into tramcars, by contract, hand labor	.1514	
23	Open face	94	.1900	3.2	[2] .60	By hand into dump carts, contract labor	.0695	[5] 2.00

[1] Rate of tons per hour would have been still higher if more of the material loaded had not been unnecessarily handled twice.
[2] Calculated from contract basis.
[3] One driver for two 1-horse carts.
[4] Men lost time waiting for delivery to crusher.
[5] Co t of care and feed only; no driver employed.

Quarry key No.	Method of delivery	Average length of haul and grade	Power			Remarks
			Kind	Cost	Unit	
1	Cars pushed and switched by men, then hoisted up incline.	400 feet down grade for car pusher. Incline by hoist engine.	Coal	$10.00	Ton	Complicated method of delivery.
2	Two independent units to two crushers. Cars pushed and switched by men, then hoisted up incline.	do	do	10.75	do	Capacity of plant doubled by adding separate and independent unit, production actually increased only 50 per cent. Method of delivery complicated.
3	Derrick swing to pier; thence by car pusher down grade to crusher.	375 feet down grade	do	10.00	do	Loading and delivery methods excellent.
4	do	do	do	8.50	do	Do.
5	1-horse dump carts	450 feet upgrade	Men and horses			These methods always expensive.
6	By derrick direct to crusher.	150 feet	Coal	9.50	Ton	Excellent system, cost would have been much lower but for unnecessary rehandling much of material during loading.
7	Steam locomotive mostly, part by mule to incline, then steam hoist.	800 feet, about level, small per cent up incline.	do	5.00	do	Typical of large-scale operations, these costs somewhat raised because of taking part of stone from a pit.
8	Men and mules on tram track.	500 feet level	Men and horses			Typical of large operations.
9	Cable pull by hoisting engine, automatic dump.	300 feet up gentle grade	Coal	10.00	Ton	One of the most efficient delivery systems, large, low tramcars, gentle upgrade, steam shovel expense too high, gravity return.
10	Horses and men	350 feet down grade	do	9.00	do	Good methods, well managed.
11	1-horse dump carts, also derrick hoist.	300 feet steep upgrade	do	10.00	do	Methods expensive, typical of most small-scale plants.
12	1-horse dump carts	200 feet upgrade	Men and horses			Do.
13	do	400 feet upgrade	do			Do.
14	do	225 feet upgrade	do			Do.
15	do	150 feet slight upgrade	do			Methods expensive, typical of most small-scale plants, men wasted time excessively.
16	By derrick and overhead cable system.	500 feet up	Coal	10.75	Ton	Costs could have been lower but for troubles with overhead cable system.
17	Steam locomotives	3,000 feet down grade	do	5.54	do	Typical of large-scale operations.
18	Car pusher, gravity	200 feet down grade	do	7.75	do	Power loading, gravity delivery, short distance and good management led to lower costs.
19	Gasoline locomotive	300 feet down grade	Gasoline Electricity	.24 .017	Gal Kwh	Typical of large-scale operations.
20	Steam locomotive to pit crusher, thence by hoist.	2,000 feet crusher in pit, then conveyor to main plant.	Coal	7.50	Ton	Do.
21	Steam locomotive	2,300 feet level	do	10.65	do	Do.
22	First by horse to foot of incline, second by electric hoist to crusher.	250 feet up by hoist engine.	Electricity	0.17	Kwh	Complicated method of delivery due to pit-type quarry.
23	First, by 1-horse carts to incline; second, by steam hoist to crusher.	125 feet level, then hoist engine to crusher in top of plant.	Coal	7.00	Ton	Loading done by contract labor at relatively higher price. Exceptional low cost for horses kept delivery costs low. Haul in quarry 125 feet, thence by bucket hoist 42 feet.

has already been mentioned. At the quarry where this arrangement was used it resulted in a cost of $0.074 per ton, and the cost of loading into the low scale boxes was also low.

Crushing and Screening.—Data on the cost of crushing and screening is presented in Table 6. Of the two quarries showing lowest costs, quarry No. 6 had an average daily production of only 292 tons of conglomerate rock which was easy to break, and quarry No. 21, 1772 tons of limestone. Both used electric power. At quarry No. 6 a No. 6 gyratory crusher was used and very little crusher feeding was necessary.

Two of the quarries listed were under the same management and crushing the same kind of rock with modern plants. At one of these quarries steam was used for power; at the other, electricity. Crushing with steam power cost $0.1013 per ton, while crushing with electric power cost only $0.0630 per ton. This difference in cost is believed to be largely the difference in cost of power.

General Conclusions

Table 7 shows the total direct cost per ton for each of the quarries, with information as to the kind and size of quarry. Comparisons of all the quarries as to cost of the various operations show that none of them maintained a uniformly high position on all items. There is a general tendency for a quarry to be among the highest group with regard to one operation and much lower down the scale with regard to the next. The total direct costs do in general vary inversely with production, but the difference would be less conspicuous if these costs included rental, or interest and depreciation on power equipment. It is believed that a relatively small-scale quarry can be operated with direct costs lower than the average, or even the best record of the large-scale quarries if good management is combined with a good layout, good equipment, electric power, and favorable conditions of face and rock. Results at quarry No. 18 demonstrate this, as it had the lowest direct production cost of any of the 23 quarries and yet had an average daily production of but 264 tons.

At many plants, especially the smaller ones, only a crude system of bookkeeping is used. As a rule the distinction is not made between bookkeeping and costkeeping. If total costs are too high, the owner does not know where the trouble lies. Indeed, within a wide range of costs that lie inside the profit line, he is likely not to know whether any or all of his costs are too high or what methods, if any, should be changed, or whether a foreman or superintendent is getting the best possible results from labor. As this is true with direct costs, so is it true with indirect costs, and a very common fault is to take little or no account of such important factors as depreciation and depletion.

Why Costs Should Be Kept

The writer studied costs at three quarries located in the suburbs of a large city which were owned and operated by a contractor doing a large business. Most of the broken stone produced at these quarries was used on his contract jobs. Such stone as was sold was sold by the yard and measured in the delivery trucks. All the rest of his product was sent by truck to centrally located scales for weighing. Incredible as it may seem, no record was made as to which of the three quarries the stone came from, and no individual records were kept of their output. The owner only knew the total production of the three quarries, which were several miles apart and under separate managements. As a matter of fact one of them was badly managed and direct costs were about as high as they could be made.

With reference to face breaking, there is no question but that modern types of hammer drills should be used for bench work and that in the long run the use of air instead of steam is economical in spite of the necessary investment in a compressor. Well drilling and wide spacing of holes and snake holing high faces reduce very largely the total costs of face breaking, and the type of explosive used should be determined by both experiment and advice from manufacturers.

Mud Capping Is Expensive

Where the scale of operation is not too large, the most satisfactory method of boulder breaking is steel balling, although this might not be applicable to the breaking of boulders in some of the tough diabases which are sometimes quarried. This must be determined experimentally. Comparative results in these studies indicate that mud capping is the most expensive method.

Loading by hand into high receptacles costs from two to three times as much as loading into low-scale boxes. Steam shovels may be economically operated in comparatively small quarries and a great deal of sledging expense saved if a reasonably large initial crusher is used.

The horse-drawn dump cart is most expensive as to both loading and delivery. Delivery by derrick, directly, and by tramcars into which the contents of derrick-handled scale boxes are dumped, are relatively inexpensive, and the results as shown in costs of delivery at quarries Nos. 3, 4 and 6 do not do justice to the method, because in each case, with insignificant increase of expense, the number of tons delivered could have been more than doubled, while the results by the dump-cart method were for the maximum capacity of operations, and any increase in capacity called for a proportional increase in expense.

For distances up to 300 ft., at least, delivery is very economically accomplished, if grade permits it, by hand-pushed or horse-drawn tramcars of 2 to 4 tons capacity. Of all the methods of delivery studied, the cheapest was the method using automatic

TABLE 6.—*Crushing and screening data, and direct costs arranged in order, from lowest to highest*

Quarry key No.	Cost per ton of broken stone	Power elements: Kind	Power elements: Cost per unit	Average daily production in tons during period
6	$0.0493	Electricity	$0.027 per kwh	292
21	.0630	do	$0.018 per kwh	1,772
19	.0724	do	$0.017 per kwh	600
18	.0764	do	$0.030 per kwh	264
16	.0816	Coal	$10.75 per ton	180
10	.0823	Electricity	$0.027 per kwh	532
17	.0827	do	$0.015 per kwh	1,820
7	.0836	do	$0.009 per kwh	1,454
2	.0896	Coal Electricity	$10.75 per ton $0.027 per kwh	260
15	.0904	Electricity	$0.030 per kwh	86
20	.1013	Coal	$7.50 per ton	1,977
13	.1060	Electricity	$0.027 per kwh	170
8	.1069	do	$0.009 per kwh	770
12	.1103	do	$0.027 per kwh	214
4	.1170	do	$0.027 per kwh	125
22	.1215	do	$0.017 per kwh	176
3	.1271	do	$0.027 per kwh	176
14	.1408	do	$0.027 per kwh	82
11	.1437	do	$0.027 per kwh	66
23	.1569	Coal	$7 per ton	94
9	.1737	do	$10 per ton	234
1	.2052	do	$10 per ton	172
5	.3423	do	$11.75 per ton	73

TABLE 7.—*Total direct production costs, kind of rock, magnitude of operation, and price of labor per hour*

Quarry key No.	Direct production cost per ton	Kind of rock	Magnitude of operation	Price of labor per hour
1	$1.3179	Granite	Small	$0.45
2	1.5250	do	Medium	.50
3	.6606	Altered granite	Small	.50
4	.8987	do	do	.50
5	1.5648	Conglomerate	Very small	.50
6	.7328	do	Medium	.50
7	.4242	Siliceous dolomite	Very large	.30
8	.5595	Dolomite	Large	.30
9	.7931	Altered diorite	Medium	.39
10	.7077	Diorite	Large	.44
11	1.2503	Altered rhyolite	Very small	.50
12	.7261	do	Medium	.44
13	1.1095	Altered andesite	Small	.45
14	1.0684	Rhyolite breccia	Very small	.50
15	1.1547	Trachytic rhyolite	do	.42
16	1.1187	Altered rhyolite	Medium	.50
17	.2828	Altered diabase	Very large	.40
18	.2535	Diabase	Medium	.43
19	.2962	Altered diabase	Large	.40
20	.3471	Dolomite limestone	Very large	.50
21	.3130	Limestone	do	.50
22	.9937	Marble	Small	.50
23	.6546	Siliceous slate	Very small	.39

dumping, 6-ton tramcars (steam-shovel loaded) pulled up a gentle grade to the crusher by a drum hoist and returned to the quarry face by gravity. A few posts set in the quarry floor as cable guides made it possible to draw these tramcars around curves, and thus made all parts of the face available for this method without unnecessary track complications or extra assistance other than such as could be given as needed by the quarry foreman. Power locomotives are of course necessary for long hauls and large operations, and simple arrangements cut down delivery expense.

Crushers above quarry floors and complicated track and switch arrangements result in high cost of delivery to the crusher. Pit-type quarries, as would be expected, have relatively high costs for delivery.

The kind of power used has much to do with costs. The more extensively electricity is used, the more economically are most of the operations conducted.

At most small-scale quarries the initial crusher is too small. The saving through use of a small crusher is usually lost several times over by increasing sledging costs.

For large-scale operations plants are usually designed, methods adopted, and layouts planned by competent engineers. On the other hand, for small plants these features usually are the result of expediency, experiment or guesswork. Sometimes they result from previous experiences, good or bad, where very different conditions prevailed.

As a rule insufficient attention is paid to the relations between the cost of boulder breaking and the methods of loading, drilling, blasting, and the size of initial crusher. The method of one operation is dependent for success upon that of another. In other words, operation methods are closely interdependent.

Whenever possible, in establishing a broken-stone plant the probable duration and both present and probable future magnitude of operations should be first determined. A large plant is, of course, not justified by small ledge holdings, and the relation between these two must be recognized. Topography must be studied and, if possible, a site for the plant procured below the level selected for the quarry floor and as near the face as blasting operations will safely permit. The ledge itself should be studied with reference to joint planes and seams, and the rock itself tested for percentage of wear. Conditions as to the former will indicate drill-hole spacing and blasting methods likely to be most satisfactory, and the latter will give information as to the probable cost of drilling.

If these considerations, together with the foregoing notes on various operations, are kept in mind, they should lead to production costs lower than those now incurred at very many existing plants.

Finally, it should be stated that no plant can afford to omit the keeping of costs on each unit of operation.

Finds Connecticut Highways Pays 23% on Investment

THE Bureau of Public Roads in connection with the Connecticut State Highway Department has issued a remarkable study covering pretty much the whole field of highway transport under the title: Report of a Survey of Transportation on the State Highway System of Connecticut. It is excellently printed and contains many maps and good illustrations, with about 100 pages of text and tables which make it one of the most valuable contributions to highway engineering literature that has yet been published.

Everyone today acknowledges that good highways pay, but how much they pay is still an open question. In this book an attempt has been made to answer this question (page 69). The annual traffic used as a basis of computation is 414,000,000 vehicle-miles involving 58,000,000 net tons of commodities and 974,000,000 passenger-miles. These are large figures and they represent a great deal of money spent in transportation, as it is figured that not less than 10c per vehicle-mile is the cost for passenger cars and 25c per vehicle-mile for trucks. It is assumed that the value of the improved highway service is 1c per passenger car-mile and 3c per truck-mile, which is certainly conservative, and from this it is calculated that the return in the year September, 1922, to September, 1923, was 23% on the amount invested in highways. The calculation takes into account everything, including the depreciation of the roads during the period specified.

No account is made of the very real but indirect returns from highway transportation such as the increase in the time value of goods delivered more promptly than by other transportation methods and the added value to real estate.

The value of Connecticut highways to the rock products industries is shown in a table of the commodities transported. Of those which are classified, groceries come first and sand, gravel and crushed stone (one item) comes second.

A very interesting comparison is made between motor truck and rail tonnage. No direct comparison between total tonnages is made, but it is shown that 90% of the tonnage hauled less than 60 miles is moved by truck. Several tables show in detail the comparative tonnage hauled between selected points and give some classification.

A point brought out in the discussion of motor truck and rail haulage is that railways have gained as well as lost by the introduction of the motor truck. The statement is made that losses to railroads in general freight "have been more than compensated by the enormous rail tonnage accruing from the manufacture, repair and delivery of the motor vehicles and their accessories, to say nothing of the propensity to travel which the motor vehicles have stimulated greatly."

The claim is sometimes made that too much is spent on highways which serve only the larger towns, but an excellent analysis of the population increase in Connecticut shows that in that state the roads are going where the people are going. Practically all of the increase in population is shown to be in those areas which are more thickly settled, and the greatest percentage of increase is shown to be in those districts which have the densest population.

A note on one of the title pages states that copies of the book may be procured from the Superintendent of Documents, Government Printing Office, Washington, D. C., for 30c each.

Yosemite Portland Cement to Open Merced Plant

ASSURANCE that the Merced plant of the Yosemite Portland Cement Co. will be in operation early next spring was given recently in a statement from officials of the organization, according to the Fresno (Calif.) *Bee*. The statement was made by G. A. Fisher, who will manage the plant.

Plans for the power plant, which it is proposed to build at the company's quarries 65 miles from Merced on the Yosemite Valley railroad, were outlined in the August 7 issue of ROCK PRODUCTS. Inspection of the preliminary work towards installation was made by Mr. Fisher recently. Contracts for two concrete smokestacks, 200 ft. high and 10 ft. in diameter, have been let, and their construction as well as the installation of a 60,000-bbl. storage bin will be started at once, it is reported.

Machinery has been purchased from the Mammoth Copper Co.'s head house at the Mammoth mine located near Kennett, Calif., for immediate installation in the plant. The lot made five carloads. Among the machinery purchased is the gravity tram used for conveying ore from the mine to the smelter. This was said to be the heaviest in the world when it was built, the maximum pitch being 68 deg., but in Merced a maximum pitch of 70 deg. is called for. The machinery is extra heavy.

An electric shovel has been delivered, it is said, to the company's limestone quarry to handle grading work preparatory to the laying of track sidings along the railroad right-of-way and the 200-ft. endless cable which will connect the quarry with the railroad.

Sluicing Sand and Gravel From Bank 300 Feet High

Modern Hydraulicking Operation Conducted by Heney Gravel Co. of Seattle, Washington

THE Heney Gravel Co. of Seattle, Wash., has a deposit on Vashon island, eight miles from Seattle and connected with it by a ferry, which it works by sluicing or hydraulicking. It is one of the relatively few deposits to which this method may be successfully applied.

Sluicing demands a very high bank in order that the rising grade necessary for the sluices may not run out too soon. It also demands abundant water and a reasonable price for power, if the water for sluicing is to be pumped; and if work is to go on throughout the year, the climate must be mild. All these conditions are found at this deposit.

The bank is 360 ft. high, counting the full distance from the water to the crest, and at least 300 ft. of it available above the top of the plant. There is the whole bay to pump from and the company can make its own power in its steam plant or buy it reasonably from the local power plant. And the climate is so mild that work can go on practically without interruption throughout the year.

Water for sluicing is supplied by two 10-in. Detroit centrifugal pumps and one 8-in. Steam Pump Co. pump. They are direct connected to General Electric motors. The power consumption of the two motors is about 300 kw. The water is carried to the face in 8-in. and 10-in. pipes laid on the ground. A 2½-in. monitor is used and the water is sent against the bank with considerable force. By keeping the streams directed against the foot of the bank the material slides loosely to the bottom so that it can be washed easily into the sluices. A stream of water from a pipe on top of the bank keeps the top gravel sliding down and prevents disastrous caving.

Formerly a "ground sluicing" system was employed without much force to the water. The present system is more satisfactory and recovers more material for the power used.

The water and sand and gravel flow into wooden sluice boxes and by these to the plant. These sluices are ordinary open troughs 12 in. wide. They have to be carried at a 12½% slope so that the fall will carry the large stones. As the rise

Power plant and bins viewed from end of loading dock

Showing how the bank is undercut

Pipe lines and branches to monitors

is 1 ft. for every 8 ft. of distance, it may be figured that the sluices will be at the top of the bank when they are 2400 ft. from the plant. But this will take many, many years of working at the present rate or even at a much increased rate.

The deposit is 60% gravel and contains comparatively few stones so large that they will not run through the sluices. One man

manganese steel wire screening. The oversize is sent to a jaw crusher and the crusher discharge to an elevator that lifts it to the flume before the screens.

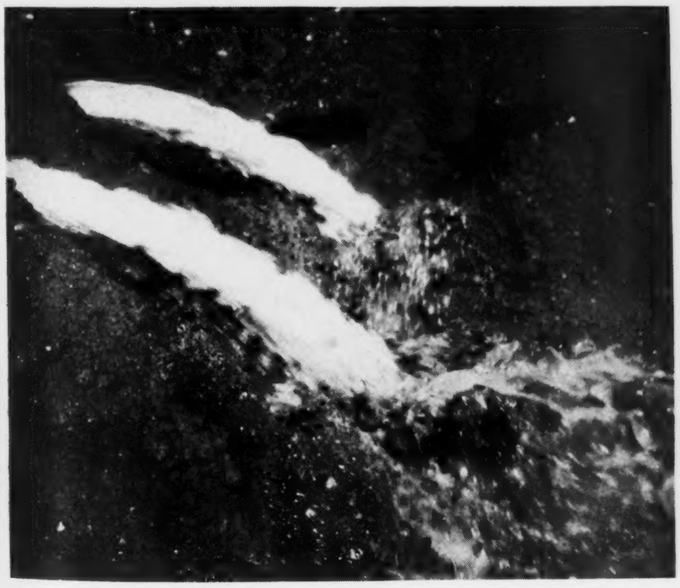
The sand and gravel next flow to two bumping screens of an ingenious design, which were built by Mr. Heney, the former owner of the plant. They stand at 45 deg. and are 5 ft. wide and 12 ft. long. They

shocks, are not hard and they do not come very often, perhaps 10 or 12 times a minute, just enough to keep the screen clean.

The gravel goes to bins and the sand and water flow over a set of sand boxes which have outlets closed with sliding doors to allow the settled sand to escape. The coarser sand flows from the first boxes and finer sand from the others.

Looking into pit where bank is 300 ft. high

Plant and dock from top of bank



Streams from monitors breaking down the bank

One man keeps open the sluiceways to the plant

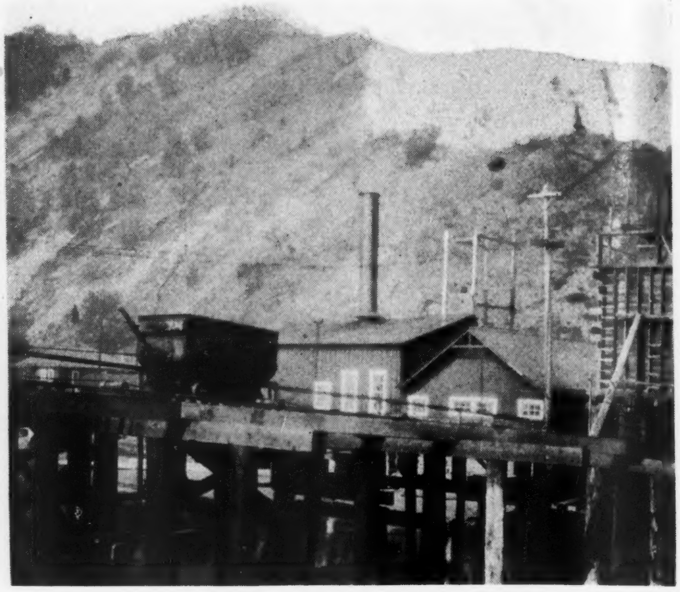
is employed at the pit attending to the streams of water and seeing that the sluices are clear.

The sluices converge near the plant and run into two permanent sluices that lead to the screens. These screens are "revolving grizzlies" 8 ft. long and 4 ft. in diameter, covered with Rollman double lock

are hung in an upright frame so that they can swing back and forth. A push rod actuated by a slowly moving cam pushes them forward and allows them to come back and strike against a timber with a slight jar. This not only starts any material that tends to stay on the screen, but it throws out pebbles which are blinding the meshes. The

From the bins the sand and gravel are loaded on the barge by a 6-yd. car which is filled from gates below the bin and pulled up an incline by an electric hoist. The end of the incline is on the dock and high enough so that barges may be placed underneath. The barges are filled by dumping the car through a hole between the rails. The barges

Hoist house and car dump over barge



Self dumping car on incline to dock

are towed to either Seattle or Tacoma, Seattle being about 20 miles distant by water.

The offices of the company are at 808 Leary building, Seattle. Howard R. Jones is in charge of the plant.

Pulverized Lime and "Popping" of Plaster

IN the article on "The Pulverized Lime Industry of New England," pp. 49-56, ROCK PRODUCTS, October 16, 1926, the rather broad statement was made "that almost any lime pulverized to 50-mesh was proof against 'popping' when incorporated in mortar or plaster." The authority given for this statement was the U. S. Bureau of Standards. We are glad to give the conclusions of the Bureau of Standards in more detail, since there is a chance that the broad general statement quoted is not wholly correct.

In the tests made by the Bureau of Standards 10% of each of the following materials were mixed with ordinary hydrate: Core, magnesia, iron carbonate, magnesium sulphate, mica, clay, sand, quicklime, pyrite, lime burned during hydration, overburned lime, salt and tannic acid. Each of these added ingredients was used in the form of material of different degrees of fineness. The summary of the results was as follows:

Classification of Materials

"Materials having no effect: Core, magnesium sulphate, sodium chloride (salt), mica and clay.

"Materials whose tendency is to cause unsoundness if coarser than 50-mesh, not bad if fine: Iron carbonate, quicklime, iron sulphide (pyrite) and lime burned during hydration.

"Material always bad regardless of particle size: Overburned lime.

"Material bad for especial reasons: Tannic acid.

"Material, information upon which was not obtained: Caustic magnesia."

As a result of these tests Warren E. Emley made the following recommendation in connection with the examination of hydrate for plastering:

"Examine microscopically to insure absence of CaO (Refractive index 1.81). Wash through 50-mesh and if residue is over 5%, analyze. If it is other than $CaCO_3$, reject the hydrate."

Effect of Fineness

According to Dr. G. J. Fink, chemical director of the National Lime Association:

"The value of these tests would have been greater if the quantity of impurity had been less because it would be only in exceptional cases that a hydrate would contain anything like 10% of quicklime or of overburned lime. Knibbs found, for example, that very small quantities of overburned lime which has been passed through a 70-mesh screen will not produce popping or disintegration. He found that a plaster made from hydrate containing small quantities of overburned lime was smooth if the latter were not coarser than 50-mesh and no actual pitting occurred with the material passing 30-mesh, but the surface was roughened.

"In general we always state without qualification that the presence of any appreciable quantity of overburned lime of any particular size is dangerous."

Practically, the manufacturers of pulverized lime have found our original statement to be true. The presence of overburned lime, as well as core, is practically impossible in pulverized lime for the reason that properly burned lime grinds much more readily than either core or overburned lime. These impurities are automatically gotten rid of in the screening operation as the tailings, and these are not reground in making a quality product.

New Jersey Production of Sand and Gravel Increases in 1925

FIGURES just made available by the New Jersey Department of Conservation and Development, working in conjunction with the United States Bureau of Mines, show that New Jersey produced 4,886,994 tons of sand and gravel valued at $3,658,312 during the year of 1925. This is an increase of 965,473 tons and $326,600 in value above the year 1924.

Building sand heads the list with 1,967,189 short tons valued at $909,433. In proportion to their value, this is followed by molding sand, of which 449,578 short tons were mined, having a value of $597,284; paving sand, 1,061,582 short tons, valued at $560,276; 195,770 tons of glass sand having a value of $310,796; 81,119 short tons of grinding and polishing sand, valued at $213,057; 47,145 short tons of fire and furnace sand, having a value of $191,764.

The total tonnage of sand mined was 3,927,748 short tons, which was valued at $2,857,001. The total output of gravel was 959,246 short tons, having a value of $801,311. There were 77 producers scattered throughout the fifteen counties of the state.

While New Jersey ranks ninth in the production of sand and gravel, these figures, it is claimed, are remarkable for so small a state.—*Jersey City (N. J.) Journal.*

Quick Setting Cement on Pennsylvania Road Jobs

VARIOUS utility companies of Pennsylvania have agreed to use rapid-setting cement where requested by the Bureau of Highways, says a recent report of the Pennsylvania Public Service Information Commission. Through its use in highly congested districts, particularly on small repair jobs, it is expected that hazards to the public will be reduced and allow earlier use of new streets.

Proportioning Cement Raw Materials

Comparison of American and German Methods of Making Three Component Mix

By W. A. and E. S. Ernst

IT is most interesting to note the appearance from time to time of such articles as the one by H. Nitzsche which appeared in a recent issue of ROCK PRODUCTS.* We are sure that the industry will welcome papers which deal with this and allied subjects, steps of much importance in the manufacture of portland cement. The proper proportioning of the raw materials is of fundamental importance if a high-grade product is to be produced. It is, therefore, very interesting as well as instructive to compare the methods employed by others with one's own, especially when those methods are described in such detail and are based on sound mathematical principles.

There is danger in too much detail, however, in that it may obscure the very point that it is meant to clarify. In other words, it may be "hard to see the woods for the trees." This seems to be the main point for criticism in the above-mentioned article. The large number of symbols, and the similarity of several of them, will tend to confuse those not well versed in mathematical usage. The point at which the second step is injected, that is changing from the ignited to the unignited materials, does not add to the clearness of the explanation. This fault, if one considers it as such, is one of arrangement only and therefore minor. If the article is to be of the greatest value to the industry, however, it appears that it should be so constructed that it will appeal to those most in need of its contents.

While a little thoughtful consideration will show plainly what was actually intended to be conveyed, that portion of the article appearing on page 70, middle column, dealing with the conversion of Kuhl and Knothe's formula, does not appear to have been correctly stated. Taken on the whole the article contains much of value and merit.

Richard K. Meade (Portland Cement, 1926, pp. 86-88 incl.) has outlined a method for the calculation of a three-component mix which is essentially the same as the one under discussion except that it has been stripped of its confusing detail. Too much so perhaps, for, from a purely mathematical standpoint it might be said that the derivation of the formula is not given in sufficient detail but, from the standpoint of simplicity and of results obtained, it is satisfactory and to the operator these two points are of prime importance.

*German Method of Proportioning Raw Cement Materials, H. Nitzsche, "Rock Products," Sept. 4, 1926, pp. 70-71.

Using the analyses submitted by H. Nitzsche as follows:

IGNITED MATERIALS

	(I)	(II)	(III)
Silica	19.27	0.28	64.83
Alumina	2.78	0.11	25.31
Oxide of iron	0.84	0.04	3.88
Lime	73.39	98.67	2.56
Magnesia	3.45	0.77	1.83
Residue	0.27	0.13	1.59

and the following symbols:

	(I)	(II)	(III)
Silica	S_1	S_2	S_3
Oxides of alumina and iron	O_1	O_2	O_3
Lime	L_1	L_2	L_3

$$r = \frac{\text{Silica}}{\text{Iron oxide and alumina}}$$

$$R = \frac{\text{Lime}}{\text{Silica} + \text{iron oxide} + \text{alumina}}$$

solve the following:

$$a = S_1 - rO_1$$
$$b = rO_2 - S_2$$
$$c = rO_3 - S_3$$
$$d = L_1 - (S_1 + O_1)R$$
$$e = (S_2 + O_2)R - L_2$$
$$f = (S_3 + O_3)R - L_3$$

The proportions of the three components are then as follows:

$$(\text{I}) : (\text{II}) : (\text{III})$$
$$ec - bf : ea - bd : cd - fa$$

If (I) is taken as the unit or

$$\text{I} = 100$$

$$\text{II} = \frac{cd - fa}{ec - bf} \times 100$$

$$\text{III} = \frac{ea - bd}{ec - bf} \times 100$$

Substituting values we have:

Desired $r = 2.6$

Desired $R = 2.26$

$$a = 19.27 - 2.6(2.78 + 0.84) = 9.86$$
$$b = 2.6(0.11 + 0.04) - 0.28 = .11$$
$$c = 2.6(25.31 + 3.88) - 64.83 = 11.06$$
$$d = 73.39 - (19.27 + 2.78 + 0.84)2.26 = 21.66$$
$$e = (0.28 + 0.11 + 0.04)2.26 - 98.67 = -97.70$$
$$f = (64.83 + 25.31 + 3.88)2.26 - 2.56 = 209.92$$

Then

I=100 parts by weight.

$$\text{II} = \frac{(11.06 \times 21.66) - (209.92 \times 9.86)}{(-97.70 \times 11.06) - (0.11 \times 209.92)} \times 100$$

= 165.83 parts.

$$\text{III} = \frac{(-97.70 \times 9.86) - (0.11 \times 21.66)}{(-97.70 \times 11.06) - (0.11 \times 209.92)} \times 100$$

= 87.50 parts.

Mixing in these proportions should give a clinker of the following composition when burned with gas or oil (that is, under conditions where the mix will not be altered or contaminated by further additions from fuel ash, etc.):

	Per cent
SiO_2	21.64
R_2O_3	8.32
CaO	67.72
MgO	1.79
Residue	0.53
	100.00
r=	2.6
R=	2.26

We have used the analyses and ratios employed in the previous article in order to make comparisons more simple. Should it be desired to calculate the proportions on the basis of the unignited materials it can be easily done by expressing the lime and magnesia as carbonate and putting in the place of "R" the value obtained by dividing "R" by 0.56.

German Cement Combine

THE commercial prospects of the portland cement trade in Germany are quoted as good, in a lately compiled composite synopsis of the view of the Hamburger *Fremdenblatt*, *Deutsche Bergwerkszeitung* and other general and trade journals and reported in the New York *Journal of Commerce*. The synopsis shows that the principle of co-operative and co-ordinated management has led to the development of great internal strength. It follows in part:

Probably in no other industry in Germany can such a widespread bond be determined as in the cement industry. The three cement unions, north, south and west, regulate the prices and the total export and there is no doubt that the cement industry has become very much greater inwardly as well as outwardly in the past years. Above all the connecting movement and the rationalizing must continue to have a very favorable influence on the price of cement.

Even beyond the boundaries of the single unions a far-reaching bond is consummated to concerns. Through the fusion of the Silesian cement industry the Groschowitz, Ltd., commands the largest share capital in the German cement industry with a capital of 27,000,000 marks. The Wicking concern in Westphalia has amalgamated itself with the portland cement works in Heidelberg, Mannheim-Stuttgart, and this union embraces not less than 30% of the entire German cement production.

Financial News and Comment

RECENT QUOTATIONS ON SECURITIES IN ROCK PRODUCTS CORPORATIONS

(These are the most recent quotations available at this printing. Revisions, corrections and supplemental information will be welcomed by the editor.)

Stock	Date	Par	Price bid	Price asked	Dividend rate
Alpha Portland Cement Co. (common)[2] new stock	Nov. 8	No par	38	41	1½% quar. Apr. 3
Alpha Portland Cement Co. (preferred)[2]	Nov. 8	100	115	....	1¾% quar. Mar. 1
Arundel Corporation (sand and gravel—new stock)	Nov. 8	No par	34¾	34¾	45c qu., 15c ext. July 1
Atlantic Gypsum Products Corp. (1st 6's carrying 10 sh. com.)[10]	Nov. 10	....	107	111	
Atlas Portland Cement Co. (common)[2]	Nov. 8	No par	43	45	50c quar. Sept. 1
Atlas Portland Cement Co. (preferred)	....	100	....	....	2% quar. Oct. 1
Atlas Portland Cement Co. (preferred)[2]	Nov. 8	33⅓	43	46	2% quar. Oct. 1
Beaver Portland Cement Co. (1st Mort. 7's)[8]	July 29	100	100	100	
Bessemer Limestone and Cement Co. (common)[4]	Nov. 8	100	135	150	1½% quar. Oct. 1
Bessemer Limestone and Cement Co. (preferred)[4]	Nov. 8	100	106	108½	1¾% quar. Oct. 1
Bessemer Limestone and Cement Co. (convertible 8% notes)[4]	Nov. 8	100	99	100	8% annual
Boston Sand and Gravel Co. (common)[10]	Nov. 6	100	75	80	2% quar. July 1
Boston Sand and Gravel Co. (preferred)[10]	Oct. 23	....	90	95	1¾% quar. July 1
Boston Sand and Gravel Co. (1st preferred)[10]	Oct. 23	....	90	95	2% quar. July 1
Canada Cement Co., Ltd. (common)	Nov. 9	100	112	113	1½% quar. Oct. 16
Canada Cement Co., Ltd. (preferred)[11]	Nov. 5	100	115	116½	1¾% quar. Nov. 16
Canada Cement Co., Ltd. (1st 6's, 1929)[11]	Nov. 5	....	101	102½	3% semi-annual A&O
Canada Crushed Stone Corp., Ltd. (6½s, 1944)[11]	Nov. 5	100	93	96	
Charles Warner Co. (lime, crushed stone, sand and gravel)	Nov. 6	No par	23	25	50c quar. July 12
Charles Warner Co. (preferred)	Nov. 6	100	101	103	1¾% quar. July 22
Charles Warner Co. (lime, crushed stone, sand and gravel) 7s, 1929[16]	Nov. 6	100	102½	103½	
Cleveland Stone Co. (new stock)	Nov. 9	....	60	66	$1.50 qu. Sept. 1
Connecticut Quarries Co. (1st Mortgage 7% bonds)[17]	Nov. 5	100	104	....	
Consolidated Cement Corp. (1st Mort., 6½s, series A)[24]	Oct. 27	....	97	99	
Consolidated Cement Corp. (5 yr. 6½% gold notes)[24]	Oct. 27	100	97	100	
Consumers Rock and Gravel Co. (1st Mort. 7s)[18]	Nov. 4	100	99	101	
Dewey Portland Cement Co. (1st Mort. 6's)[30]	Nov. 10	100	....	99½	
Dolese and Shepard Co. (crushed stone)[7]	Nov. 9	50	88	90	$1.50 quar. Oct. 1
Egyptian Portland Cement Co. (7% pfd. with com. stock purchase warrants)[21]	Sept. 24	....	96	100	1¾% quar. Oct. 1
Egyptian Portland Cement Co. (common)[21]	Sept. 24	....	14	18	40c quar. Oct. 1
Egyptian Portland Cement Co. (warrants)[21]	Sept. 24	....	10	15	
Giant Portland Cement Co. (common)[2]	Nov. 8	50	55	60	
Giant Portland Cement Co. (preferred)[25]	Nov. 8	50	50	55	3½% s.-a. June 15
Ideal Cement Co. (common)	Nov. 9	No par	67	70	1¾% quar. July 1
Ideal Cement Co. (preferred)[6]	Nov. 6	100	106½	109½	$1 quar. July 1
International Cement Corporation (common)	Nov. 9	No par	52⅞	53⅛	$1 quar. Sept. 30
International Cement Corporation (preferred)[2]	Nov. 8	100	103⅞	104	1¼% quar. Sept. 30
Kelley Island Lime and Transport Co.	Nov. 8	100	130	133	$2 quar. Oct. 1
Lawrence Portland Cement Co.[2]	Nov. 8	100	85	100	2% quar.
Lehigh Portland Cement Co.[6]	Nov. 8	50	86	89	1½% quar.
Lyman Richey Sand and Gravel Co. (1st Mort. 6s, 1927 to 1931)[13]	Nov. 8	100	99	100	
Lyman Richey Sand and Gravel Co. (1st Mort. 6s, 1931 to 1935)[13]	Nov. 8	100	97	98	
Marblehead Lime Co. (1st Mort. 7's)[14]	Nov. 8	100	104	106	
Marblehead Lime Co. (5½% notes)[14]	Nov. 8	100	98	100	
Michigan Limestone and Chemical Co. (common)[6]	Nov. 8		26	....	
Michigan Limestone and Chemical Co. (preferred)[6]	Nov. 8	....	24	26	1¾% quar. July 15
Missouri Portland Cement Co.	Nov. 9	25	54	55	50c Nov. 1
Monolith Portland Cement Co. (common)[9]	Nov. 4	....	11½	12	
Monolith Portland Cement Co. (units)[9]	Nov. 4	....	28½	30	
Monolith Portland Cement Co. (preferred)[9]	Nov. 4	....	8½	9	
Nazareth Cement Co.[26]	Nov. 4	No par	39	41	75c quar. Apr. 1
Newaygo Portland Cement Co.[1]	Nov. 8	....	120	....	
New England Lime Co. (Series A, preferred)[14]	Nov. 8	100	....	95	
New England Lime Co. (Series B, preferred)[22]	Nov. 8	100	92	97	
New England Lime Co. (V.T.C.)[22]	Nov. 8	....	35	38	
New England Lime Co. (6s, 1935)[14]	Nov. 8	100	99	101	
North American Cement Corp. 6½s 1940 (with warrants)	Nov. 9	100	94⅝	94¾	
North American Cement Corp. (units of 1 sh. pfd. plus ½ sh. common)[19]	Aug. 14	....	94	99	2 mo. period at rate of 7%
North American Cement Corp. (common)[19]	Nov. 8	....	20	22	
North American Cement Corp. (preferred)	Dec. 31	....	....	....	1.75 quar. Nov. 1
North Shore Material Co. (1st Mort. 6's)[15]	Nov. 10	100	98½	100	
Pacific Portland Cement Co., Consolidated[5]	Nov. 5	100	61	62½	½% mo.
Pacific Portland Cement Co., Consolidated (secured serial gold notes)[5]	Nov. 5	100	96¾	97½	3% semi-annual Oct. 15
Peerless Portland Cement Co.[1]	Nov. 8	10	6¼	6¾	
Pennsylvania-Dixie Cement Corp. (1st Mort. 6's)[29]	Nov. 10	100	99¼	99¾	
Pennsylvania-Dixie Cement Corp. (preferred)[28]	Nov. 10	100	....	99½	
Pennsylvania-Dixie Cement Corp. (common)[28]	Nov. 10		....	39⅞	
Petoskey Portland Cement Co.[1]	Nov. 9	10	9¼	9¾	1½% quar.
Pittsfield Lime and Stone Co. (2 sh. pfd. and 1 com.)[10]	Oct. 23	....	....	220	
Rockland and Rockport Lime Corp. (1st preferred)[10]	Nov. 8	100	105	....	3½% semi-annual Aug. 2
Rockland and Rockport Lime Corp. (2nd preferred)[10]	Nov. 8	100	60	....	3% semi-annual Aug. 2
Rockland and Rockport Lime Corp. (common)[10]	Nov. 8	No par	50	55	1½% quar. Nov. 2
Sandusky Cement Co. (common)[1]	Nov. 8	100	115	125	$2 quar. Oct. 1
Santa Cruz Portland Cement Co. (bonds)[5]	Nov. 5	....	105¾	....	6% annual
Santa Cruz Portland Cement Co. (common)[5]	Nov. 5	50	80	....	$1 quar. $1 ex. Dec. 24
Superior Portland Cement, Inc. (Class A)[20]	Nov. 4	....	42½	43¼	
Superior Portland Cement, Inc. (Class B)[20]	Nov. 4	....	21	22	
United Fuel and Supply Co. (sand and gravel) 1st Mort. 6s[27]	Nov. 10	100	98	100	
United Fuel and Supply Co. (sand and gravel) 6% gold notes[27]	Nov. 10	100	99	101	
United States Gypsum Co. (common)	Nov. 10	20	160¼	160¼	2% quar., $1.40 and 35% stk. ex. Dec. 31
United States Gypsum Co. (preferred)	Nov. 10	100	116½	119	1¾% quar. Dec. 31
Universal Gypsum Co. (common)[3]	Nov. 10	No par	10½	11	
Universal Gypsum V.T.C.[3]	Nov. 10	No par	10	10½	
Universal Gypsum Co. (preferred)[3]	Nov. 10	....	72	76	1¾% quar. Sept 15
Universal Gypsum and Lime Co. (1st 6's, 1946)[3]	Nov. 10	100	96	....	
Union Rock Co. (7% serial gold bonds)[18]	Nov. 4	100	99	101	
Wisconsin Lime and Cement Co. (1st Mort. 6s, 1940)[15]	Nov. 10	100	98	100	
Wolverine Portland Cement Co.	Nov. 10	10	6	7	3% Nov. 15

[1]Quotations by Watling, Lerchen & Co., Detroit, Mich. [2]Quotations by Bristol & Willett, New York. [3]Quotations by True, Webber & Co., Chicago. [4]Quotations by Butler, Beading & Co., Youngstown, Ohio. [5]Quotations by Freeman, Smith & Camp Co., San Francisco, Calif. [6]Quotations by Frederic H. Hatch & Co., New York. [7]Quotations by F. M. Zeiler & Co., Chicago, Ill. [8]Quotations by Ralph Schneeloch Co., Portland, Ore. [9]Quotations by A. E. White Co., San Francisco, Calif. [10]Quotations by Lee, Higginson & Co., Boston and Chicago. [11]Nesbitt, Thomson & Co., Montreal, Canada. [12]E. B. Merritt & Co., Inc., Bridgeport, Conn. [13]Peters Trust Co., Omaha, Neb. [14]Second Ward Securities Co., Milwaukee, Wis. [15]Central Trust Co. of Illinois, Chicago. [16]J. S. Wilson Jr. Co., Baltimore, Md. [17]Chas. W. Scranton & Co., New Haven, Conn. [18]Dean, Witter & Co., Los Angeles, Calif. [19]Hemphill, Noyes & Co., New York. [20]Quotations by Bond & Goodwin & Tucker, Inc., San Francisco. [21]Baker, Simonds & Co., Inc., New York. [22]William C. Simons, Inc., Springfield, Mass. [23]Blair & Co., New York and Chicago. [24]A. B. Leach and Co., Inc., Chicago. [25]A. C. Richards & Co., Philadelphia, Penn. [26]Hincks Bros. & Co., Bridgeport, Conn. [27]J. G. White and Co., New York. [28]Mitchell-Hutchins Co., Chicago, Ill. [29]National City Co., Chicago, Ill. [30]Chicago Trust Co., Chicago.

QUOTATIONS ON INACTIVE ROCK PRODUCTS CORPORATION SECURITIES ON PAGE 75

Editorial Comment

Construction and Weather

As the end of the 1926 building season approaches it becomes apparent that the unusually bad weather of the season has had its effect on construction. Rains, which in some parts of the country were torrential, causing much damage to property and loss of life, were reported as exceptionally heavy from practically all parts of the country. These prevented the pouring of concrete as well as other forms of construction and this is reflected in the slight decline of portland cement shipments and production from July 1 on, although the total for the first nine months of 1926 exceeds the total for the same period of 1925 by about 1½%.

The surprising thing is not that there should have been delays in construction but that these delays should have caused so small a decline in the volume and value of construction. This shows that engineers and contractors are learning to carry on their work, regardless of weather conditions. A comparatively few years ago it was thought impossible to pour concrete in cold weather, but now pouring goes on steadily in periods of sub-zero temperature. By the building of good roads the delay in delivering material in bad weather has been reduced, and, most important of all, there is the change in the point of view of engineers and contractors regarding weather conditions. They used to feel that they were helpless when bad weather came on, but now they feel that it is absurd that so small a matter as a shower should delay the progress of construction.

New Aggregate Specifications

At the present time two important specification making bodies (committees of the American Society for Testing Materials and the American Concrete Institute) are struggling with the making of national specifications for coarse and fine aggregate. Both have advanced tentative specifications, but it is apparent that these have been advanced only to awaken the public to the necessity for such specifications and to invite suggestions and constructive criticism.

The making of aggregate specifications is not so easy as to make them for lime or gypsum, for example, as these would deal only with a single material while aggregates are made from several widely varying materials. And aggregate materials which are abundant in one section are hardly to be found in another. A further difficulty comes from the fact that aggregates which are quite satisfactory in the warmer parts of the United States cannot be safely used elsewhere.

Nevertheless, it seems to be agreed that we must have a national specification for aggregates. The user wants them in order to be sure that he gets only material that is fit for his work wherever he may be, and the producer wants them because specifications are the surest defense against the competition of unfit materials, such as those that come from the wayside pit. And there is a sufficient basis for writing aggregate specifications in what is actually known of soundness, cleanliness, grading and the other characteristics which a good aggregate should have. The state highway departments seem to have been fairly successful in writing aggregate specifications and have thus pointed the way to a general national specification.

One state, Kansas, is considering, or has already adopted, a specification for fine aggregate based on the fineness modulus. This seems a reasonable and logical step. Assuming that aggregates are equal in soundness, cleanliness and freedom from deleterious organic and inorganic materials their value for making concrete depends on their grading and size. The measure of these qualities is the fineness modulus. This is quite universally accepted, so there would seem to be no reasonable objection to incorporating the fineness modulus in specifications. It would apply to *all* aggregates equally—crushed stone, gravel or slag—and it is perhaps the only characteristic common to all aggregates. Then why should it not be used for writing a specification?

It would be easy to provide for unusual cases by putting a penalty (perhaps a requirement for additional cement) on aggregates with a fineness modulus below a certain limit and providing a premium on aggregates with a fineness modulus above a certain limit with, of course, an upper limit for rejection clearly defined.

The specifications which call for maximum and minimum allowable percentages of certain mesh sizes are really only an effort to obtain a satisfactory fineness modulus. Would it not be simpler to specify it directly?

The Small Quarry

One of the most significant paragraphs in the Bureau of Public Roads' investigation into crushed stone costs, printed elsewhere in this issue, is that which contains the words: "It is believed that a relatively small scale quarry can be operated with direct costs lower than the average." A vice-president of one of the largest crushed stone producing companies expressed the same opinion recently to a ROCK PRODUCTS editor. The large company has admitted advantages, perhaps the principal one being its ability to secure capital to extend operations, eliminate waste by finding new uses for its material and to open new markets. But in the straight production of crushed stone the small producer can hold his own, so far as costs are concerned. It should be added, howeve, that the small producer who knows how to hold his own in the matter of costs does not usually remain a small producer very long.

QUOTATIONS OF INACTIVE ROCK PRODUCTS SECURITIES

Stock	Date	Par	Price bid	Price asked	Dividend rate
Coplay Cement Mfg. Co. (common) (4)	Dec. 16	....	12½	....	
Coplay Cement Mfg. Co. (preferred) (1)	Dec. 30	....	70	....	
Eastern Brick Corp. 7% cu. pfd.) (1)	Dec. 9	10	40c	....	
Eastern Brick Corp. (sand lime brick) (common) (1)	Dec. 9	10	40c	....	
Edison Portland Cement Co. (common)4	Sept. 11	50	20c	....	
Edison Portland Cement Co. (preferred)	Nov. 3	50	17½c(x)	.. ...	
International Portland Cement Co., Ltd. (preferred)	Mar. 1	....	30	45	
Iroquois Sand & Gravel Co., Ltd. (2 sh. com. and 3 sh. pfd.) (1)	Mar. 17	....	$12 for the lot	....	
Lime and Stone Products Co. (1100 sh. pfd., $10 par and 700 sh. com., $10 par)	Feb. 10	....	$66 for the lot	....	
Missouri Portland Cement Co. (serial bonds)	Dec. 31	....	104¾	104¾	3¼% semi-annual
Olympic Portland Cement Co. (g)	Oct. 13	....	....	£1⅝	
Phosphate Mining Co. (1)	Nov. 25	....	1@5	....	
River Feldspar and Milling Co. (50 sh. com. and 50 sh. pfd.) (1)	June 23	....	$200 for the lot		
Rockport Granite Co. (1st 6's, 1934)2	Aug. 31	....	90	....	
Simbroco Stone Co. (pfd.)	Dec. 12	....	....	....	$2 Jan. 1
Southern Phosphate Corp.6	Sept. 15	....	1¼	....	
Vermont Milling Products Co. (slate granules) 22 sh. com. and 12 sh. pfd. (6)	Nov. 3	....	$1 for the lot	....	
Wabash Portland Cement Co.1	Aug. 3	50	60	100	
Winchester Brick Co. (preferred) (sand lime brick) (5)	Dec. 16	....	10c	....	

(g) Neidecker and Co., Ltd., London, England. (1) Price obtained at auction by Adrian H. Muller & Sons, New York. (2) Price obtained at auction by R. L. Day and Co., Boston. (3) Price obtained at auction by Weilepp-Bruton and Co., Baltimore, Md. (4) Price obtained at auction by Barnes and Lofland, Philadelphia, Pa. (5) Price obtained at auction for lot of 50 shares by R. L. Day and Co., Boston, Mass. (x) Price obtained at auction by Barnes and Lofland, Philadelphia, on November 3, 1925. (6) Price obtained at auction by Wise, Hobbs and Arnold, Boston, Mass.

Redeem Old Dixie Cement Securities

A REPORT in the Chattanooga (Tenn.) *Times* states that the redemption of the Dixie Cement Corp. securities has been started by the Hamilton National Bank, Chattanooga, Tenn. This in accordance with the merger agreement by which the Dixie company was consolidated into the Pennsylvania-Dixie Cement Corp. (See ROCK PRODUCTS, July 24 and October 2 issues for details of merger.) The preferred stock, it is said, will be taken up first and the $1,000,000 of stock outstanding will be redeemed at par. The common stock will bring $280 per share.

The Hamilton National Bank reports that the securities of the new cement company are being taken up rapidly and some of the issues already oversubscribed. Approximately $1,000,000 worth of these securities were allotted the bank for purchase by former Dixie stockholders if they desired to reinvest.

Pacific Portland Plans New Financing

ACCORDING to recent announcement, the Pacific Portland Cement Co., Consolidated, is to decrease its monthly dividend from 50 cents to 25 cents per share, beginning with the dividend payable November 5, 1926. This is said to be a part of the directors' policy of conservatism and preference to have part of the construction costs of the new mill now building to come from the company's earnings.

A recent letter to the stockholders states that the work of increasing the capacity of the Redwood City plant will be continued, and that the company expects to "provide from cash on hand and earnings $650,000 and to raise approximately $1,000,000 through new capital financing. It is proposed to increase the present capacity by an additional 3,000 bbl. a day. This will enable us to hold our old plant in Solano county as a standby and reserve, and will effect a substantial saving in cost. The work on the new plant at Redwood City has already begun, and it should be ready for operation about one year from date. This additional installation will cost about $1,650,000."

The letter further states: "The company is in a very satisfactory financial condition, and in spite of adverse marketing conditions existing for more than a year, the earnings for the year 1925 showed a surplus of 33% over dividends; the earnings for 1926 to date are equal to the earnings for the same period during 1925.

"As a matter of conservative policy and after careful study and analysis of the entire situation, the directors unanimously feel it would be to the best interests of the company that a portion of its construction costs be paid out of the company's earnings, by reducing temporarily the present monthly dividend from 50 cents to 25 cents per share per month, beginning with the dividend payable November 5, 1926."

Yosemite Portland Increases Capital

THE stockholders recently increased the authorized class "A" common stock (par $10) from $1,500,000 ($740,690 outstanding) to $2,000,000. The company also has an authorized issue of $1,500,000 class "B" common stock, par $10 (none of which is outstanding). Part of the additional class "A" stock has been offered publicly at par ($10 a share). The proceeds are to be used to pay for construction of Merced, Calif., plant, etc.

International Agricultural Bonds Offered

FOSTER, McCONNELL & CO. are offering at 89¾, to yield over 6%, $1,000,000 first mortgage collateral trust 5% sinking fund gold bonds of the International Agricultural Corp. This offering does not represent new financing by the company.

Dated May 1, 1912; due May 1, 1942. Interest payable in New York City. Company pays normal income tax up to 2%. Pennsylvania state tax refunded. Redeemable, all or part, for sinking fund only upon any interest date upon 30 days' notice at 103 and interest.

The following data are from a bankers' circular:

Corporation.—Is engaged, either directly or through its subsidiary companies, in the mining of phosphate rock and the manufacture of commercial fertilizers. The phosphate rock mined in excess of the corporation's requirements is sold to other fertilizer manufacturers. It is estimated the corporation has available reserves of phosphate rock sufficient, at prevailing rates of production, to afford a supply for more than 50 years. Corporation sells its phosphate rock, fertilizers and other products through dealers direct to farmers, over 75% of such sales being made for cash.

Earnings.—The earnings of the corporation before deductions for depreciation, depletion and federal taxes, have been as follows:

For the 11 months ended May 31, 1926	$2,093,335
For the year ended June 30, 1925	1,923,690

Total income available for bond interest in the past two years has average approximately five times the average annual amount of such charges.

The Florida phosphate properties of the corporation, either owned or controlled, comprise 42,266 acres located in Polk, Hillsboro and Hardee counties, of which acreage 22,620 has been prospected and estimated to contain more than 41,000,000 tons of available phosphate rock. Corporation has a mining capacity at these properties of 800,000 tons annually. In the past 12 years the average shipments have been approximately 400.000 tons annually.

The Tennessee phosphate mines of the corporation comprise 2,976 acres of land located in various counties, a part of which is estimated to contain at least 5,900,000 tons of brown phosphate rock of an average grade in excess of 72% bone phosphate of lime. Of this acreage the corporation owns 2,389 acres in fee and has 587 acres under lease.

Corporation has a one-half interest in the stock of a company operating a potash mine in Germany, the output of which is unusually high grade, and which is being successfully operated at the present time. Corporation also owns and has for sale several parcels of land aggregating about 20,000 acres located in Hillsboro and Polk counties, Florida.

INTERNATIONAL AGRICULTURAL CORP. CAPITALIZATION

	Authorized	Outstanding
First mtge. and coll. trust 5% 20-year sinking fund gold bonds, due 1932	$14,994,800	*$6,202,800
First mtge. and coll, trust 5% 20-year sinking fund gold bonds (extended to 1942)		†8,792,000
		*$6,202,800
		†8,792,000
Prior preference stock	10,000,000	10,000,000
Common stock (no par value)	450,000 shs.	450,000 shs.

*Held by public, $1,208,000; held by trustee as additional security for the extended bonds, $4,994,800.
†Of this amount $1,771,700 held in treasury.

U. S. Gypsum Declares Large Extra Dividends

THE directors of the U. S. Gypsum Co. at their recent meeting declared a common stock dividend of 35% and a cash extra of \$1.40 on the common, in addition to the regular quarterly of 40 cents on the common and 1¾% on the preferred stock. All of the declarations are payable December 31 to stockholders of record December 4. Following this action the common stock of the company advanced from 144 to 170¼, a gain of 16¼.

In each of the two previous quarters the company paid an extra of \$1 on the common stock, and on December 31, 1925, a 15% stock extra on common was disbursed. In 1924, the regular annual dividend rate on common dividend was 4%, but in that year an extra cash payment of 27% was made, together with an extra stock dividend of 35%. In 1923, in addition to the regular 4% dividend, there was a 20% extra in stock.

According to the *Chicago Journal of Commerce*, the dividend action was regarded in stock market circles as another indication of the strong position of the company, which has long been a leader among speculative favorites on the Chicago Stock Exchange, despite a period of comparative inaction in recent weeks.

Net earnings for the six months ended June 30 were slightly ahead of the first half of last year, amounting to \$4,139,829, or \$7.54 a share, on the common stock outstanding after deduction of preferred dividends. This compares with \$4,091,268, or \$7.46 a share, on the common in the same period of 1925.

It was expected that the rumored settlement of patent litigation which it is said will bring about \$2,000,000 annually into the United States Gypsum treasury would be officially announced. Several conferences looking to arrangements whereby other dealers may manufacture a standard-edged wall board under an agreement with U. S. Gypsum Co. are said to have been held recently, but no announcement of the results have been forthcoming.

International Cement Third Quarter Earnings

THE net income of the International Cement Corp. for the 9 months ended September 30 and after all charges and taxes, was equal to \$4.75 a share on 562,500 common shares outstanding, after deducting preferred dividends, against \$5.79 a share earned on 500,000 common shares outstanding in the similar 1925 period.

Hayden, Stone & Co., in a circular dealing with the company, state in part: The corporation is in an extremely strong financial position. It has no funded debt, the \$2,176,583 in 1919 having been completely eliminated by 1924. Its current position is excellent; current assets being over three times current liabilities; cash exceeding \$2,000,000, and net quick assets exceeding \$5,700,000. Very liberal deductions from earnings have been made for depreciation and depletion. The productive capacity at the beginning of 1927, when present construction is completed, will be carried at a valuation net of depreciation of less than \$2.30 per bbl.

Earnings for the first 9 months of 1926 were equivalent to \$4.75 per share on the 562,500 shares of stock now outstanding. Estimate of earnings for the last 3 months give \$6.25 for the full year. The above are on the basis of 562,500 shares, whereas this amount has been outstanding only since August 11 (increased from 500,000 shares). The 1926 earnings also do not include earnings to be derived from the increased productive capacity which will be available at the beginning of 1927.

Pennsylvania-Dixie Earnings

FOR the 12 months ended September 30, 1926, the Pennsylvania-Dixie Cement Corp. reports profit from operations applicable to interest of \$5,134,301. This compares with profit of \$4,764,470 for the year ended December 31, 1925. After depreciation and depletion, and allowance for interest on the first mortgage bonds, federal income taxes at 13½% and dividends on the preferred stock, the amount applicable to the common stock for the 12 months to September 30, 1926, was \$7.14. In the year 1925, \$6.34 per share was earned on the common stock.

The consolidated balance sheet as of September 30, 1926, giving effect as at that date to the redemption of Dexter bonds, called for payment November 1, 1926, and the retirement of notes payable out of cash, shows current assets of \$8,202,148, as against current liabilities of \$1,777,678, leaving net working capital of \$6,424,470. This compares with working capital shown by the adjusted consolidated balance sheet as of July 31, 1926, issued at the time of the company's recent consolidated and financing, of \$6,024,865. Surplus as of September 30, 1926, was \$2,699,886, as compared to surplus as at July 31, 1926, of \$2,247,702, an increase in the three months of \$452,184 after writing off all organization expense.

CONSOLIDATED BALANCE SHEET, INTERNATIONAL CEMENT CORP.

Assets		Liabilities	
Capital assets: plants, property, etc.	\$29,690,537	7% preferred stock	\$ 9,768.400
Cash	2,097,846	Common (562,500 shares, no par)	18,595,339
Marketable securities	28,176	Capital stock of subsidiaries not owned	183,497
Accounts receivable, less reserve	1,950,160	Accounts and accruals payable	1,438,874
Notes receivable, less reserve	253,346	Dividends payable Sept. 30, 1926	733,702
Inventories	4,260,622	Provision for income taxes	628,244
Reserve for fluctuations in exchange	42,919	Employes' subscription to capital stock	162,461
Deferred and proposed items	355,903	Surplus of subsidiaries set aside	85,255
		Earned surplus	6,997,899
Total	\$38,593,672	Total	\$38,593,672

National Gypsum Declares Initial Dividend

IN a letter to stockholders dated October 29, 1926, J. F. Haggerty, president of the National Gypsum Co., Buffalo, N. Y., announced the declaration of the initial dividend on their preferred stock at the rate of 7% per annum. This action following only four months' actual production program would appear to indicate successful operation of the first mines and plants of the National Gypsum Co.

In his letter Mr. Haggerty states: "Our plant at Clarence is still continuing to make very satisfactory progress. Business from the trade is coming in in increasing volume. Our current earnings are at the rate of more than twice our preferred dividends and the ratio will naturally increase as we continue to improve our Clarence operations and especially when our second plant is in operation next spring."

English Cement Manufacturers Prosper

FROM reports in several English journals, it would appear that the past year has been a profitable one for several of the British cement companies. The Aberthaw and Bristol Channel Portland Cement Co. declared dividends of 7½% on the preferred and 15% on the common stock. For the year ended March 31, the Ship Canal Portland Cement Manufacturers, Ltd., reports a profit of £110,243 (about \$550,000) as compared with £82,642 (about \$412,000) for the previous year. The usual dividend of 7½% less income tax on the preferred stock was paid and £50,000 transferred to the depreciation account. A policy of conservatism, notwithstanding the fact that plant and machinery, etc., after writing off depreciation, would stand in the books at about \$14.80 per ton of production capacity, was followed by the directors and so extra dividends were not paid. An increase of about 20% in production over that of 1925 was also reported by the company.

Employe Stock Ownership

TO secure a practical working knowledge of employee stock ownership plans, the Policyholders' Service Bureau of the Metropolitan Life Insurance Co. has consulted 60 firms in the United States and Canada and has set forth its findings in a new report entitled "Employee Stock Ownership." The list of cooperators in this report contains the names of some of the largest and best known industries in both countries.

The problems of title of stock, dividend payments, sale and transfer, as well as cancellation and repurchase of stock are all discussed in detail in this 24-page report, which may be secured on request from the Policyholders' Service Bureau, Metropolitan Life Insurance Co., 1 Madison avenue, New York City.

Cement and Quarry Operating Men Discuss Safety and Welfare

Continuation of the Report of the Proceedings of the National Safety Council's Detroit Convention

THE plant doctor is getting to be more and more a factor in accident prevention, safety and welfare work in the portland cement industry. As noted in the first portion of this report on pp. 86-88, ROCK PRODUCTS, October 30, the Riverside Portland Cement Co., Riverside, Calif., has gone so far as to give all its employes a very thorough physical examination every year. Discussion of Eugene T. Green's paper on this work of the Riverside company showed that there is a growing appreciation of the desirability of having a plant doctor, on whole or part time, to look after the physical welfare of employes at other times than may be necessary to patch them up after accidents.

Plant Hospitals

Along similar lines of reasoning an active, rather than an occasionally used, plant hospital is desirable. In other words, the plant hospital should be used as a free clinic for employes. N. P. Lounsbury, safety engineer, Nazareth Cement Co., Nazareth, Penn., said that his company has a plant hospital with a male trained nurse constantly in attendance. They have never had a case of infection which kept a man away from work. He said it paid in dollars and cents, and it paid in altruistic satisfaction.

For taking care of the treatment of non-occupational hurts, injuries and diseases, the Riverside company, Mr. Greene said, had a mutual benefit association. Those employes receiving less than $100 a month pay dues of 50 cents a month, others pay $1 a month. Out of the fund thus created any defect or disease of employes may be treated without expense to them, the company continuing to pay wages during the treatment.

So successful has been the Riverside method of preventing accidents by keeping men fit, that Mr. Green is inclined to the belief that guarding machinery is of secondary importance. Proof of this cited was that 50% more accidents occurred at the company's Riverside plant than at its Oro Grande plant, in spite of the fact that the Riverside plant has more mechanical safeguards.

Accident Prevention at Glens Falls

Edward H. Parry, Glens Falls Portland Cement Co., Glens Falls, N. Y., described the first year's work and results in a systematic and determined attempt to reduce accidents at his plant. Accidents at this plant in 1925 included two deaths and 16,891 hours lost time. After this record safety work started in earnest. The first thing was a thorough survey of plant and environment to find out what was wrong. There had always been some organization for accident prevention, yet all departments of the plant had uniformly bad records.

The employes are largely Italians and French Canadians. The real seat of the trouble was the conviction on the part of these employes that the work was necessarily dangerous and a sacrifice of lives was unpreventable. Consequently a campaign of education was instituted at once. A foremen's committee was organized and the campaign outlined. The responsibility for accidents was placed fairly and squarely on the foremen. Results showed immediately in whole-hearted support to the program.

Safety is now placed on the same basis of importance as production and general efficiency. The foremen make up a central safety committee and secondary committees are composed of representative workmen in each department. There are weekly meetings, attendance at which is compulsory. The 14 departments of the plant are put on a competitive basis for three-month periods at a time. After a period of three months getting organized and started, second period ran 127 days without a lost time accident. The most valuable lesson learned was the cutting out of "vacations" on account of very minor accidents, or injuries.

Mr. Parry gave a remarkable illustration of the cash value of safety work. In 1925 the cost of the company's liability and compensation insurance was $13,590. For the first six months of 1926 it was $1700—an estimated saving for 1926, if the same record is kept up, of at least $9000. Mr. Parry concluded from these results that a cash bonus to employes for safety records was fully justified, and was really returning to employes saving in insurance cost, which they make possible.

Quarry Shelters for Blasting Operations

Quite an interesting discussion took place at the cement-mill session on devices to shelter employes in quarries during "pop shooting," or breaking up boulders. W. F. Weidner, quarry superintendent of the Mitchell, Ind., plant of the Lehigh Portland Cement Co., mentioned the steel cylinders he was using, and which he said had been described in ROCK PRODUCTS (April 21, 1923). These shells are now made especially for the purpose in what he described as a drum cone type. They are made in various sizes to shelter three or more men, and are easily rolled about on the quarry floor.

First Aid

One feature of the quarry section meeting was a first aid demonstration by Jay E. Thompson, secretary of the Toledo Safety Council. At the cement mill section there were given many interesting instances of lives saved through a knowledge of first aid on the part of plant employes. A remarkable instance of the value of this first aid education was given by Superintendent Hamilton of the Ironton, Ohio, plant of the Alpha Portland Cement Co. Fifteen employes of this plant who had taken the U. S. Bureau of Mines course in first aid and artificial resuscitation saved 75 men overcome by fumes from a mine fire. Another instance was given where an apparently dead man had been brought back to life after working on him for one hour and fifteen minutes.

There was some criticism of the medical profession in giving up men as dead too readily; one speaker even suggested the quickest way to get results was to have the doctor declare the man dead, and clear out, giving his companions a fair chance to try resuscitation!

Use of Life Lines

The principal paper read at the combined quarry and cement mill sections meeting on October 28, by Dr. Lansburgh, secretary of labor and industry of the state of Pennsylvania, was published in full on pp. 86 and 87 of ROCK PRODUCTS, October 30. Much of the discussion concerned Dr. Lansburgh's recommendation for the use of life lines for men working on the quarry face. It was developed that life lines for men working on the quarry face is at present quite rare, and confined largely to slate quarries. Dr. Lansburgh said it must be a matter of slow education to get quarry employers to equip workmen with life lines, and a matter of difficult education to get the men to use them; but life lines were being adopted in other hazardous industries, such as structural

steel erection, and he believed they would eventually be adopted by quarry face workmen.

The discussion developed into one concerning the use of life lines and life belts generally. Accidents to men who go into bins at cement mills, to make the material run, are among the commonest cause of fatalties in this industry. Instances were given where even the use of life lines and attendants had failed to save men caught in cave-ins of the material; the attendant left the man for a moment to get a drink; the attendant let the rope get too slack, etc. An objection to the use of life lines, pointed out by Val Robertson, safety engineer of the Canada Cement Co., Ltd., Montreal, Que., is a false sense of security it gives workmen. Everything depends on the vigilence of the attendant.

Various methods were suggested for eliminating the necessity for men going into bins to work. The use of compressed air is common for loosening finely ground dry matecials. J. W. Hawk, master mechanic of the France Stone Co., Toledo, described an agitating device for loosening limestone screenings in a bin, which is described in this issue under "Hints and Helps for Superintendents." The Iola, Kan., plant of the Lehigh Portland Cement Co., according to Superintendent Woodruff, has lost five men in bin accidents, in the course of a few years. Now the bins are so constructed as to have a concrete shelter from which the men can work without going into the material.

"Mike" Hunter, safety engineer of the U. S. Gypsum Co., said that because of the hazard of bin accidents orders from headquarters were that access to bins was made only through locked doors, with the keys in the hands of the foremen. No workman was permitted to go into a bin unless the foreman accompanied him. If the man was required to stay and work in the bin, the foreman did not leave him until an attendant had been supplied to stay with the workman and take care of the life line.

W. F. Weidner, quarry superintendent of the Mitchell, Ind., plant of the Lehigh Portland Cement Co., gave the following rules for the use of life belts: Never allow bins to be opened when men are working in the bins; the shorter the rope, and the more nearly the fastening is directly over the workman the better; allow no slack in the rope. He does not use a belt to fasten the rope to the workman but a double rope with a hitch that the man himself may let out when he requires more line.

The use of life belts for crusher tenders was discussed in much detail. Apparently there are few instances of men being killed in crushers. At the Bellefonte plant of the American Lime and Stone Co., A. C. Hewett, chief engineer, said they used safety lines for the men feeding a large jaw crusher. Instead of a belt, a harness, more like a coat, is used, so that should the man be caught in the crusher the life line will keep him in an upright position.

Most of the accidents to crusher tenders, it appears, come from handling and dumping cars at the crusher. The men tending the crushers and dumping cars should have control of the hoist. Accidents happen when the hoist man acts on his own judgment. Mechanical feeders are an aid in making crusher accidents unnecessary.

Quarry Section Meeting

The quarry section meeting opened with an interesting resume of the brief history of this section of the National Safety Council by Chairman E. E. Evans, Whitehouse Stone Co., Toledo, Ohio. Little more than a year old, the increase in membership of this section in the past year was 80%. Four meetings have been held during the year. As a result of the organization of the quarry section the National Crushed Stone Association has appointed two committees which are working along similar lines, an accident prevention committee and a welfare committee.

Russell Frame, Chairman of Cement Mill Section

Chairman Evans mentioned the meeting at Columbus (reported in ROCK PRODUCTS, October 30, pp. 74 and 75) and the progress made toward a state code for safety in quarry operation in Ohio. He said the opposition and most difficulty was encountered from the smaller quarry operators, and that it was largely their negligence of adequate provision for accident prevention which made quarry compensation insurance rates in Ohio so high.

F. T. Kearns, director of the division of safety and hygiene of the state of Ohio, described how the Ohio code was being written with the assistance of a general advisory committee in which were representatives of both employers and employes. In putting the proposed code into effect, Mr. Kearns emphasized the necessity of whole-hearted assistance on the part of employers. It is intended to make surveys of the various operations and to hold meetings and give lectures under auspices of the state office.

W. F. Smith, safety department of the Ford Motor Co., Detroit, gave a splendid talk on the general subject of safety education. He described in detail the Ford company methods, where this education begins at the employment office. Strange to say, the most trouble with 70,000 employes comes from the trained and experienced workman. He is the one who takes chances and violates the safety rule. He can, however, be brought into line by an appeal to his loyalty to the organization.

Handling Explosives

F. F. McLaughlin, France Stone Co., describes in more detail than in his paper of last year the safe handling of explosives. He said in part:

"The greater part of blasting accidents are caused by careless, ignortant men—ignorant, I mean, about the proper and safe use of explosives. This seems as simple as saying twice two is four, but if saying it ten thousand times right here and now would help to seat this fact firmer in your minds, and by its guidance give you future relief from blasting accidents, it would be worth our time and interest to repeat it that many times together.

"In handling and using explosives the sensible way is the right way, and the right way is the safe way. To be free from blasting accidents requires no miracle. It is only necessary to be sensible—and being sensible with explosives is comprised simply of knowing what to do and doing it.

"Safety with explosives is a matter of knowing the actual details of its nature. The first step in knowing how to prevent blasting accidents is to learn how they have and will occur—and this step must deal with the explosive itself as well as the human factor involved in its use. Nitrated chemicals form the base of most of the explosives in use today. Ordinary starch, ammonia and glycerine are treated with acids in such a manner that the resulting chemical will produce a large volume of gas in an infinitesimal space of time when given an initial detonating impulse. It is by confining for a short time the rapidly expanding gas from a detonated explosive that we make it do its intended work of fracturing or rupturing some material in which we have located it. These acid-treated chemicals are mixed with and are carried in a non-explosive base material to make them much safer to handle and use. Combustion, explosion or detonation of an explosive can only occur from certain specific causes and under specific conditions.

"High explosives will detonate of their own accord when heated to 200 deg. Centrigrade. They will begin decomposition at a temperature as low as 60 deg. Centrigrade.

For this reason they should not be stored in a place excessively warm to your body nor located for blasting purposes in a hot bore hole. Neither should they be stored or used in a place excessively cold, unless made specifically low-freezing, because some explosives become rigid, congealed, or "frozen" under such conditions and are much more susceptible to explosion by friction when in such condition. As a rule, when a paper cartridge wrapper shows a brown, oily stain, or when the cartridge is hard and rigid, or when it is wet and soggy, do not use it. Call in the manufacturers' representatives and let them advise you.

"Most explosives start burning easily and burn rapidly, partly due to the parafined paper wrapper in which they are packed, and partly to the inflammable nature of the chemical itself. A small spark will set it afire, and if the gases of such combustion cannot readily diffuse with free air the increased temperature will lead to its explosion. Avoid sparks or any kind of fire from all sources during any part of your blasting operations. The steam shovel, locomotive, crane, hot carbon of gas engine, exhaust pipes, matches from the men's pockets and dottle from their pipes, metal, or imbedded rock on the tamping pole can all produce a fire hazard to the explosive. Take steps to prevent these from occurring.

"High explosives under such conditions will explode or detonate from the friction of rough handling in or out of the box or bore hole. Mark this word "rough." High explosives will stand a lot of abuse when it is in a normal condition, but this fact offers us excuse for forming habits in using it that become potential accident makers when the condition of the explosive is not normal. Lightning will detonate explosives or any of the commercial detonators for explosives. If you have located explosives on a shot, in or out of the bore holes, and lightning approaches, avoid possible trouble by removing all your men to a good safe distance from it until the disturbance is well gone. Do not poke or jar or hammer an explosive roughly or heavily with any kind of a tool, wooden or otherwise, and do not tamp the explosive if you wish to be thoroughly safe. Tamp the stemming above the explosive if you will, but keep the tamping rod well away from the detonator or its connections. The detonator caps are even far more "sensitive" than the explosive, and their nature must be respected and treated in this light.

"Avoid having any more men working on or about a shot than is absolutely necessary. The safety of all can be endangered by one—the more men, the greater the chances for trouble and the more affected when trouble does hit. A foresighted manager can usually keep his blasting operations sufficiently ahead to make rush jobs unnecessary. I wish to repeat to you a suggestion made in our meeting in the convention of last year, that you give earnest consideration to the quite reasonable amount of safety provided in blasting operations by the use of a wooden peg and rope with which to lower explosive cartridges into bore holes. Four things this practice assures—it prevents "hung" or lodged cartridges in the bore hole, and the subsequent possibility of trouble involved in dislodging them; it prevents rough treatment of the detonator and its connections; it prevents excessive friction on the explosives; it gives the blaster exact information regarding the location of every cartridge in the bore hole. To some this practice may seem to involve a considerable amount of extra work; but we have developed, with the co-operation of the explosive makers, the use of 25-lb. cartridges of 5-in. diameter, in both the pulp type and gelatin.

A. C. Hewitt, Secretary of Quarry Section

Either of these will handle easily on a peg, and when you can thus load a case of explosives in two movements the labor argument against 'pegging' is largely dissolved. Several explosive makers have indicated their willingness to cease packing explosives so snugly in the box as to make it necessary to knock off the lid, turn the case upside down, and dump the entire contents in order to gain the explosive from the case. It is a better way to have the explosive case of sufficiently greater length than the enclosed cartridges as to make it easy for the men to open the lid of the case and lift the cartridges from the case, leaving the packing and the box to be removed entirely from the shot. Loose paper and sawdust are not good companions for the explosive around the bore holes.

"The task of connecting the detonators or 'hooking up' a shot requires special, specific knowledge and should be committed to a very few good men who know what they are doing and how to do it, and for their ability to think before they act. This part of your blasting is better and more safely accomplished after all other workmen have left the shot. Electricity the invisible, and therefore dangerous to human life, when used with electric blasting caps to detonate explosives, should be used with the exercise of every available precaution to prevent a premature blast. Power lines adjacent to a blast should be well insulated and located off the ground. Power lines with frayed insulation laying on wet ground can cause stray currents to enter detonator wires with the comparatively small amount of current it takes to fire one. Be sure that your mechanical methods of connecting current to the blast are in such a location, of such a type, and are used in such a manner that a premature blast is impossible; that the shot-firer cannot be reached by flying fragments from the blast, or that anyone can open or close the switch save one to whom is delegated that responsibility. Any of you men who have had to pay compensation costs because this was *not* done know wherein the sense of it lies.

"A blasting machine or 'battery' often spends much of its time exposed to elements poor for its health. Knowing this, many older blasters, preparatory to its use to fire a shot, will push the rack bar down three or four times to 'pep' up the magneto in the generator. It is totally unnecessary to connect the leading wires from the shot to the blasting machine until the moment before firing the blast. Observe this precaution and avoid premature blasts that may occur if the blasterer unconsciously 'peps' the blasting machine with the lead wire tied to it. Misfired or unfired explosive charges in the midst of a mass of a made shot form one of the extremely hazardous results that can occur to a blast. After it is done there is no safe cure for it.

"Prevention is the sensible course. Misfires are ordinarily caused by detonator failure or improper connections or improper use of current. The two last causes you can control. As for the first cause, I regret to say that there has not yet been made and sold a continuously 100% efficient detonator. So long as this is a fact we cannot have perfect freedom from misfired holes. There still remains this mark of attainment for detonator manufacturers to strive for. So long as there is an unfired cap located in an explosive charge, with the chance of anything hard striking the cap with force, there is a chance for a serious accident to occur. Explosives will sometimes detonate when loose in blasted material and struck with a shovel dipper. They will almost always detonate if an imbedded cap is discharged. Even explosives that have lain unexploded in a shot for some years do not always have their power dissipated to a point of safety. When cordeau is used as detonator, misfired charges can be caused by broken lines, wet or poorly made connections, the cordeau curved in too short an arc, and by ignoring the proper detonating sequence of rows in connecting multiple row shots.

"In laying out the ground or connecting line of cordeau, distance should be so considered that multiple row shots will fire from the face back. Countered cordeau only should be used in the holes because of its

greater strength and resistance to the friction of loading explosives and stemming in the bore hole. Cordeau only should be used on top to connect the cordeau in the holes. It is a safer, simpler manner of detonating the holes than the practice of detonating the cordeau in each hole with a cap. It is unwise to depend on one cap to a hole. If the single cap happens to be faulty, a misfired hole will be the usual result. Do not bend a short right angle in that short part of the cordeau that arises above the hole. Let it stand straight up and at right angles with the connecting line. Protect all cordeau connections from possible dampness.

"Where electric blasting caps are used, misfired charges can be caused by the detonator wires having been broken or bared and shorted, due either to the method used of loading the explosives or tamping the hole. By testing each electric cap with a galvanometer before using it, and rejecting those that indicate an exceptionally high resistance, you can control a part of the trouble caused by faulty caps. There is, however, no way for you to determine the condition of the detonating chemicals inside the cap. Use at least two No. 8 electric blasting caps in each separate explosive charge in a bore hole. Be sure that a sufficient amperage and voltage is available to care for an electric blast. Most of the explosive makers have prepared, and will send you for the asking, a table for figuring current needs for different conditions.

"I personally think it is wise to use not only the same make caps in all the holes of a shot, but also to use the same length exploder wires on all the caps in a shot, equalizing, as nearly as possible, the action of the electric current on all the caps. Avoid multiple connections as much as possible, especially when using alternating current, for this is a prolific source of misfires. It is better to arrange your transformer to have sufficient current to be safely able to connect every cap direct to the lead line on the shot. A blasting machine will give variable results. Do away with its use if possible, but if you must use one don't forget that with a two-post machine all the caps must be connected in one series or circuit. In general, when using electric blasting caps do not abuse the insulation on the wires, make all splices and connections good and tight, and keep all bare wire off the ground. Scrape to brightness all wires to be spliced. When you encounter trouble in the electric blasting process do not go on and trust to luck. Get someone on your job to find and tell you what is wrong.

"Fuse and ordinary blasting caps, used mainly for block-hole work in secondary blasting, can cause an extraordinary amount of trouble if not stored and handled properly. An immense amount of energy is stored in the business end of a blasting cap and can cause some costly damage if it lets go at the wrong time and in the wrong place. They are very sensitive to sharp blows and should not be mashed in the blacksmith shop between the anvil and a hammer. It may seem just a little foolish for me to use your time telling you that a pants or shirt pocket, or an open box, is not a fit place to carry or store blasting caps, and that they ought never be stored or carried adjacent to explosives. In an Ohio State Safety meeting last month we were advised from a credible source that last year over nine hundred accidents were caused by the improper use of blasting caps.

"It pays to buy and use well made forty-second fuse—but don't kink it or unroll it when it is cold and brittle, and don't expect it to function when allowed to draw dampness. A good 'pop-shooter' is a valuable man. He gets the big pieces down to small ones for you, and he doesn't leave any unexploded charges in the rock to go through the dipper, into the cars, and down to the crusher to finally let go with a shower of hard rock in your crusher-feeder's anatomy. But don't skimp his good work with poor, cheap fuse, and don't growl about the extra 6 in. he cuts on the length to make himself and the rest of the boys twenty seconds safer.

"Is it necessary to say that when making any kind of a blast the responsibility rests with us to be positive that everything is ready for the blast before we fire it? Highways should be guarded by men with red flags; respect should be given to possible approaching electric or steam trains; your men should be all well in the clear. Insist on the elimination of chance-takers. We may as well get into the habit now of being responsible for human safety adjacent to a blast, because it won't be long until we will have to even consider the traveler in the air. Place in charge of your blasting a good, sensible man who has the time actually to be on the blast himself, and you will have gone a long ways toward the prevention of accidents due to the use of explosives."

Other Features of the Program

A paper on the "Financial Aspects of the Safety Movement in the Crushed Stone Industry," by A. T. Goldbeck, director of the bureau of engineering, National Crushed Stone Association, is published, practically complete, beginning on this page. A luncheon address, "Safety a Sales Problem," by J. R. Davis, general manager, United States Gypsum Co., was published complete in Rock Products, October 30, p. 75.

Officers Elected

Russell Frame, insurance manager, Alpha Portland Cement Co., Easton, Penn., was re-elected chairman of the Cement Mill Section; T. F. Halpin, assistant to the general manager, Marquette Cement Manufacturing Co., Chicago, vice-chairman; the office of secretary of this section, heretofore filled by H. G. Jacobsen, was not voted on at this meeting.

The new officers of the Quarry Section are: Chairman, L. R. Cartwright, vice-president and general manager, Mid-West Crushed Stone Co., Indianapolis, Ind.; vice-chairman, D. C. Souder, insurance manager, France Stone Co., Toledo; secretary, A. C. Hewett, chief engineer, American Lime and Stone Co., Bellefonte, Penn.

Financial Aspects of the Safety Movement in the Crushed Stone Industry*

By A. T. Goldbeck

Director, Bureau of Engineering, the National Crushed Stone Association

MERELY to consider the financial aspects of the safety movement to the exclusion of the more vital phases of safety seems almost unhuman. The complete subject of safety, however, looms up as a tremendous one when all of its ramifications are joined together. Each phase merits detailed study, the unhuman as well as the human, for their individual development cannot but advance the entire safety movement.

When severe accidents occur, invariably the morale of the workmen is much lowered and production suffers for an indefinite period thereafter, even though the men do not actually quit work for the remainder of the day as so frequently happens. These are intangible things in that they cannot be evaluated, but there can be no doubt of their financial bearing. As has recently been pointed out by Byron O. Pickard: The total or complete economic cost of human accidents must include:

a—Premiums paid for compensation insurance to cover compensation paid for lost time and cost of hospital and medical attendance.

b—The portion of the lost time wage suffered by the workman for which he is not compensated.

c—The lost time and delayed production caused by the numerous occurrences of the production accident, represented by the human accident.

d—The lost time and the temporary decreased production resulting from the breaking down of the morale, etc. (especially

*Abstract of a paper delivered at the Annual Safety Congress, October 25, 26, 1926, Detroit, Mich.

large if the accident results in a fatality).

e—The lost time and delayed production resulting from the breaking in of a new employe.

f—The increased liability of human and production accidents happening to or caused by the new employe.

g—The economic loss through the killing of a workman who has no dependents. Few state laws require any compensation except burial expenses to be paid for fatalities to persons having no dependents.

h—Incomplete compensation for fatalities. It is estimated by the U. S. Bureau of Labor statistics that the economic loss through a fatality is 6000 shifts. If each fatality was compensated for this amount of time at one-half time wages, using an average wage of $5 per shift, the compensation for fatality based on the economic loss would be $15,000, but the average actual compensation paid for each fatality is about $3000.

He further estimates that if the above items are considered in the cost, that the loss due to human accidents in industry is as great as, if not greater than, five times the amount paid out in compensation for lost time wages. It is quite evident, therefore, that the losses sustained by the employer extend far beyond the mere payment of insurance premiums, although even this item is a very considerable one whose reduction would be well worth the effort.

It might be interesting to cite the experiences of others to show the financial benefits accruing from the adoption of safety measures. In a certain mining district safety work was started in July, 1924. During 1924, the district produced 1,044,554 tons of concentrates and during the year 1925, 1,507,450 tons of concentrates, an increase of 44%. During these same periods the accidents increased only 28% and, furthermore, the "lost time accidents," that is, accidents in which the miner lost more than the day on which the accident occurred, were decreased from 59.2% in 1924 to 38.9% in 1925. Comparing similar statistics, it has been found that whereas during the last six months in 1925, 28 mines produced on an average of 1733 tons per accident during the first six months in 1926 these same mines produced 2051 tons per accident. Furthermore, the percentage of "lost time accidents" was decreased from 42.8% for the last six months in 1925 to 37.2% for the first six months in 1926. In addition to this, a study of the costs of insurance showed that whereas during 1923 nine of the co-operating companies were paying $5.04 to $8.47 for compensation insurance, on a $4.06 base rate per $100 of payroll, in 1926 these same companies were only paying from $4.18 to $6.52 per $100 of payroll on a $6.25 base rate.

Saved 51% on Insurance

It is stated in connection with a particular mine and smelting company that during the year 1925 the actual cost of carrying insurance on their property was $2.30 per $100 of payroll, including the cost of adjusting and medical and figuring their insurance on a basis stipulated by the rating bureau for their classification, a saving of 51% over the years before the study of safety began. For the first eight months of 1926 their actual cost per $100 of payroll has been $2.10 and their saving below the classification rating will be approximately 60%.

During the first six months in 1924 the lost time on account of injury was 1678 days. The income of the employes losing this time would have been $5,104.72. The total compensation benefit they received was $2,688.64, leaving a net loss to their employes of $2,416.08, or over $400 per month.

During the first six months in 1926, or after the various safety measures had been enforced for one year or longer, the total lost days on account of injury were 1073. The income of the employes losing this time would have been $3,245.33. The compensation payments on account of lost time were $2,095.04, leaving a net loss to the employes of only $1,150.29, or less than $200 per month, or just one-half of the monthly loss two years before when safety measures were not so thoroughly undertaken.

Steel Corporation Saves Millions by Safety Provisions

It is said that accidents in the construction industry cost that industry $120,000,000 annually. Judge Gary of the U. S. Steel Corporation says that "Accident prevention is not only good morals and good ethics, but also good business." In 10 years the U. S. Steel Corporation expended over $9,000,000 for accident prevention which netted them a return of over $14,000,000. The American Car and Foundry Co. expended in 14 years approximately $1,000,000 for accident prevention work. After auditing their books they show a saving of $2,700,000, represented by reductions in liability and compensation payments. These are very definite cases where considerable financial savings have been effected through the adoption of definite safety measures and by the carrying on of well regulated safety campaigns.

Crushed Stone Producer's Experience

One crushed stone producer in the Middle West gives his experiences as follows:

"At the beginning of the 1926 operating season we undertook to work along the lines suggested by the National Safety Council, using their posters and bulletins at the plants and having foremen caution workmen with reference to their own safety and installing additional safety devices wherever possible. The direct result of this effort is shown in the following figures taken from our last year's report up to October 1, 1925: Accidents from which employes lost one or more days work, 27; accidents reported for which no time was lost excepting for first aid, 14. Our 1926 records taken up to date show only 14 accidents from which employes were compelled to stop work for one or more days and 12 accidents from which employes lost only time necessary for first aid.

"These figures seem to indicate that our safety program has had practically no result as far as minor scratches and bruises are concerned, but that practically one-half the serious accidents have been eliminated. We are so well satisfied with this program that we are planning to inaugurate organizations among the employes themselves for the promotion of safety at the beginning of next year's operation.

"Aside from the humanitarian viewpoint, this reduction of serious accidents will reflect itself in reduced compensation premiums and in more efficient and unbroken operation. Whenever a serious accident occurs the workmen are not fit for duty the rest of the day. Things are wholly disorganized and production greatly reduced for the time being. We are thoroughly convinced that we can afford to spend a considerable amount of time and money to promote safety from both humanitarian and financial viewpoints."

H. G. Jacobsen, formerly manager of accident prevention and insurance bureau, Portland Cement Association, has stated that the cement industry has saved several hundred thousand dollars over a period of the last five years, due in part to many of the member companies carrying their own insurance and also to obtaining a complete revision in basic rates. In one case a particular company had about two years ago completed a new plant in a state where there was no other cement plant and the rating bureau in that particular state applied a most excessive basic rate to this plant. This matter was taken up on the basis of experience records with the result that a reduction in the insurance rate of more than 40% with a corresponding saving to the member company of more than $4000 per year was brought about.

Is more evidence needed to demonstrate the fact that safety does pay big financial returns? If such huge industries as represented by the United States Steel Corporation have found savings of millions of dollars over a comparatively short term of years, does it seem unlikely that another huge industry, the crushed stone industry, will not have a corresponding experience if a thorough safety campaign is undertaken?

American Lime and Stone Has No Accident Month

WITH every employee cooperating in the policy of no accidents, the American Lime and Stone Co., Bellefonte, Penn., set a record for the month starting September 19 and ending October 19, according to the Bellefonte (Penn.) *Democrat*. The indicator in front of the office did not show a man down. Therefore no days were lost. Heretofore as many as twenty accidents have happened at the company's various plants which have resulted in many days time—a loss to the individual and the employer. Since the company has adopted the slogan of no accidents, there has been an appreciable cut in the number each month.

"The One Per Cent Safety Bonus Plan"*

By G. S. Brown
President, Alpha Portland Cement Co., Easton, Penn.

WHAT I would like to do is, if possible, to bring some message of encouragement to you men who are working continuously to reduce accidents in the cement industry. My interest in this matter changed from the sentimental to the practical about 1910 or 1911 when the first compensation laws were being discussed by the legislatures of New York and of New Jersey. As I recall it now, the first law was passed by the state of New York and was later declared unconstitutional. This was followed by the enactment of a law in New Jersey which passed the constitutional test, and thereafter New York passed another law which also was declared constitutional. Since that date nearly all of the other states have passed compensation laws.

As a result of these early laws a determined effort on the part of the management of the Alpha company to reduce the number of accidents about its plants was begun. Our work at first was more or less intermittent, but the fact that I, during the years from 1911 to 1915, was in close contact with the operation of the plants of this company brought home to me in a very emphatic way the real importance of accident prevention work; and as time went on, I gradually came to see that no effort that we could make to prevent the maiming and killing of our workmen was too great or costly to be tried.

While I no longer have the close contact with the operations of our plants that I had in those years, I still have the same active interest in the accident prevention work of our own company and of our industry, and it is a matter of pride with me that not only have the efforts of the Alpha company had a measure of success, but the work of the accident prevention committee of the Portland Cement Association has also been successful.

Many different methods have been tried by the company that I represent and by other companies in the industry to stimulate the interest of the men themselves in this work. When we first started work, the greatest stress was laid upon the protection of machinery. I was very soon convinced that by far the major number of accidents about our works came from the carelessness and neglect of the individual who was hurt or of some fellow employe, rather than from unprotected machinery. Therefore, while we continue to follow the suggestions of the various state commissions, as to the protection of machinery, we felt that our real job was to get the co-operation of our employes themselves, and that has been our effort for the past 10 years.

Frankly, it has been discouraging at times to see, that in spite of all we have attempted to do, after the final figures are made up and a review of the results for the year made, we at times seem to have gone backward. In recent years, however, I feel that we, as well as the industry, have made real progress. Shortly after the first of this year we made a careful study of the accident records of the Alpha company and were far from satisfied with the result. We had, we thought, impressed the executive force with the sincerity of the president and directors in regard to this work, but evidently they had not gotten that fact across to the employes. I came to the conclusion that perhaps a monetary reward would stimulate the interest and enthusiasm of our employes, and after careful consideration by the management and consultation with the operating officials of our various plants, the Alpha company established what we call "The 1% safety bonus plan."

Without going into all the details of this plan, it is sufficient to say that if a mill has operated for a month without a lost time accident, the employes of that plant are entitled on each pay day, so long as the plant goes without a lost time accident, to an addition of 1% of their earnings as shown by the payroll. We are much pleased with the results so far. The lost time accidents for the first nine months of this year at the various plants operated by us aggregate 40; the lost time accidents for the same period in 1925 were 94. The number of days lost during the same period in 1926 was 855, and in 1925 there were 1539 days lost. The days lost per 100,000 man hours worked for the first nine months of 1926 aggregate 48, while for the year 1925 the number of days lost per 100,000 man hours worked was 494, which includes an allowance for four fatalities.

We have been extremely fortunate up to date this year, in that we have had no fatal accidents. Whether this safety bonus will in the long run continue to bring good results, time only can tell, but I am convinced that it has brought about a much greater degree of co-operation on the part of our management and employes than has been known in our organization heretofore. This attitude was well expressed by one of our superintendents, who in an address to the employes under his supervision said, "When the company not only asks us to be careful but is willing to pay us for looking after ourselves, we certainly ought to comply with its request."

I have touched upon the value of co-operation and I think we may say that our industry has succeeded in getting not only a fair measure of co-operation on the part of the workmen, but, in many instances, on the part of the management of our plants. Nevertheless, there is, it seems to me, still lacking in many companies that full measure of interest and co-operation on the part of the chief executives which they should have. These men, in my judgment, should give more hearty and continuous support to the efforts of those who are charged with the actual work of educating our employes to safety methods. I speak from the standpoint of the chief executive of an organization, but I am sure that many of you present are executives also, although it may be in a subordinate capacity, and I want to urge upon you most emphatically complete and thorough co-operation on your part with the efforts that are being made in your plants for the prevention of accidents. I think there can be no truer statement made than this, "The attitude of the management will determine the attitude of the employes." If the attitude of the management is that of carelessness or intermittent attention to this particular problem, you can hardly expect workmen to have any other than the same viewpoint. If, on the other hand, the management takes a personal interest in these efforts, if it shows that it is willing to spend money for the protection of machinery and the education of its employes, it can expect a hearty response from these employes.

*Part of a paper delivered at the Annual Safety Congress, Detroit, Mich., October 25, 26, 1926.

Tennessee White Cement Plant Well Under Way

WORK on the new Cumberland Portland Cement Co.'s plant at Cowan, Tenn., is progressing so rapidly, says a report in the Nashville (Tenn.) *Tennesseean*, that the scheduled operation date, March 1, 1927, may find the plant producing. Some of the machinery is already in position and preparations are being made to place the rest as it arrives from the manufacturers. The steel frame construction work of some of the buildings has been erected

The Cumberland company proposes to manufacture a white portland cement, using raw materials from a 1000-acre deposit near the plant site. Initial production, it is said, will be about 2000 bbl. per day, but the plans allow for the additional other units to double the capacity, if it should be desired at a future time. The entire cost of the plant, limestone and clay deposits, employes' homes, etc., is estimated to run about $1,200,000. The officers and others interested in the project are as reported in ROCK PRODUCTS, February 20 issue. W. V. Davidson is president and J. A. Greene, H. M. Greene, Frank Pearson, C. V. Hicks and others are closely identified with the new company.

Revised Schedule of Crushed Stone Officials Transcontinental Trip

TWO other meetings, one at Atlanta, Ga., and the other at Nashville, Tenn., have been added to the list of meetings scheduled to take place in various cities along the transcontinental route by officials of the National Crushed Stone Association and local crushed stone men. The complete list of meeting places, times, and men in charge is now as follows:

List of Meetings and Individuals in Charge of Them

Monday, November 8—Madison, Wis., meeting, Hotel Loraine, 1.00 p. m. A. J. Blair, vice-president Lake Shore Stone Co., 600 Canal street, Milwaukee, Wis.

Tuesday, November 9—St. Paul-Minneapolis meeting, Minnesota Club, 1.00 p. m. John Wunder, John Wunder Co., Broadway and K streets, Minneapolis, Minn.

Wednesday, November 10—Omaha meeting, Hotel Fontenelle, 9.00 a. m. Thomas Sullivan, 1042 Omaha National Bank building, Omaha, Neb.

Thursday, November 11—Cheyenne, Wyo., meeting, Chamber of Commerce, 10.00 a. m. C. J. Cunningham, S. Cunningham and Son, Horse Creek, Wyo.

Thursday, November 11—Denver, Colo., meeting. James Lawrence, Golden Basalt Products Co., Golden, Colo.

Saturday, November 13—Salt Lake City meeting. Eric Ryberg, Utah Sand and Gravel Products Corp., P. O. Box 1214, Salt Lake City, Utah.

Thursday, November 18—Portland, Ore., meeting. Daniel Kern, president, Columbia Contract Co., 294 East Salmon street, Portland, Ore.

Monday, November 22—San Francisco, Calif., meeting, 10.00 a. m. A. R. Wilson, Granite Rock Co., Watsonville, Calif.

Tuesday or Wednesday, November 23 and 24—Los Angeles, Calif., meeting. G. A. Rogers, Union Rock Co., 1403 East 16th street, Los Angeles, Calif.

Monday, November 29—El Paso, Texas, meeting, Hotel Orndorff, 10.00 a. m. A. Courchene, president, El Paso Limestone Quarries, El Paso, Texas.

Tuesday, November 30—San Antonio, Texas, meeting, Hotel Gunter, 10.00 a. m. R. J. Hank, secretary-manager, Southwestern Division of the National Crushed Stone Association, 310 Littlefield building, Austin, Texas.

Thursday, December 2—New Orleans, La., meeting, Hotel St. Charles, 10.00 a. m. I. L. Lyons, Jr., Southern Mineral Co., New Orleans, La.

Friday, December 3—Atlanta, Ga., meeting. Thomas McCroskey, Box 292, Knoxville, Tenn.

Saturday, December 4—Nashville, Tenn., meeting. A. B. Rodes, 610 Twelfth avenue, N., Nashville, Tenn.

Solvay Company to Reopen Moline Crushing Plant

THE Solvay Process Co.'s crushing plant near Moline, Kas., will be again put in operation within a short time, according to a report in the Moline (Kas.) *Advance*. Following a survey made by H. A. Pearse, the company engineer, J. W. Byrnes, superintendent of the plant, has started preliminary work on reconstruction, etc. The plant is expected to be in full operation by March 1, 1927.

The entire plant will be electrified and its capacity doubled. The plans call for an electrically operated railroad for conveying stone from the quarries to the crusher and electric loading shovels. The Solvay company's deposits is considerable and contains about 22 ft. of high calcium stone. Output of the plant will go into road and concrete material and agricultural limestone.

Southern Limestone Company Formed in Tennessee

A NEW company, the Southern Limestone Co., was recently organized at Harriman, Tenn., by L. O. Scott, J. N. Baker and W. C. Anderson of Nashville and J. E. Rhodes of Franklin, according to the Nashville (Tenn.) *Banner*. W. C. Anderson will be manager of operations, which have already begun.

Crushed stone will be made for all commercial purposes, railroad ballast, concrete work of all kinds, and especially road construction materials.

Work has been started on a spur track of the Southern Railway. Contracts for ballast are reported to have been completed with several railroad companies. The initial production of the plant will be from 500 to 1000 tons per day, it is stated.

Barrick Company's Lime Plant Damaged by Fire

A RECENT report in the Westminster, Md., *Times* states that the lime plant and buildings of S. W. Barrick and Sons, near Woodsboro, Md., were swept by fire of unknown origin. The greater part of the damage was done to the hydrating plant and the equipment therein. Loss is said to be about $35,000 to $40,000, partially covered by insurance.

The Barrick company operates 20 kilns producing a high calcium lump lime and some ground lime. S. W. Barrick is the principal owner.

Monroe Residents Ask Blast Damages

THE case of 85 residents of Monroe, Mich., and vicinity against the France Stone Co., asking that the company be enjoined from operating a stone quarry, which was started in September, 1925, was resumed recently before Circuit Judge Jesse H. Root, according to the Detroit (Mich.) *Free Press*. The petitioners are asking $150,000 damages.

The France company's quarry and plant are located just south of the town. The plant was recently destroyed by fire and is now being rebuilt and is expected to be in operation by February, 1927.

L. M. Palmer to Head Universal Gypsum and Lime Co.

EXTENSIVE changes in the executive personnel of the Universal Gypsum and Lime Co., recently formed through the consolidation of Universal Gypsum and the Palmer Lime and Cement Co., were effected at a recent meeting of the directors. L. M. Palmer, Jr., formerly president of Palmer Lime and Cement Co., was elected president of the new concern to succeed W. E. Shearer, who resigns from the active management but was elected chairman of the board.

Other officers are Oliver Mitchel, re-elected as first vice president; Gleason G. King, second vice president; C. F. Kaler, treasurer, and F. G. Krumholz, secretary and assistant treasurer.

The directors were told at the meeting that earnings for the current month are the best in the history of the company, with the prospects for the future bright. It has been found necessary to increase plant facilities, appropriations being voted for additional gypsum block capacity at Fort Dodge, Iowa, and for a larger stucco output at the Akron, Ohio, plant. No borrowing or new financing will be necessary for these expansions, it was stated.

Engineers and Architects to Inspect Slate Quarries

OVER 2300 architects in the Middle Atlantic district and 500 engineers in the vicinity of Easton and Bethlehem have been sent invitations to join in an inspection tour of Pennsylvania slate quarries and mills. The trip will start on Thursday, November 18, and continue through Saturday, November 20. There will be meetings of Committee D-6 on slate, American Society for Testing Materials, and of the Lehigh Valley section, American Mining and Metallurgical Engineers. An interesting program has been arranged which includes the football game between Lehigh and Lafayette universities on November 20. Complete information regarding hotel reservations and football tickets may be had by writing the National Slate Association, 791 Drexel Bldg., Philadelphia, Pa.

Brooksville Stone Company Starts Operations

THE first carload of rock from the Brooksville Prepared Stone Co., Brooksville, Fla., was sent from their quarry two miles south of the city recently, according to J. B. Gore, treasurer and general manager, in the Tampa (Fla.) *Tribune*.

The company's plant, on the site of the first hard rock quarry in this section, was completed a few weeks ago, representing an investment of $100,000. W. D. Smith is president; J. M. Smith, vice-president; and Henry Smith, secretary. J. W. Miller, who is said to be a pioneer in early Florida phosphate mining, is the company's superintendent.

Plan $3,000,000 Cement Plant for Mississippi

WE are officially informed by Lee B. Mills, Jackson, Miss., that the Mississippi Portland Cement Corp. has been incorporated (on October 26 at Jackson, Miss.) with a $3,000,000 capital to build a portland cement plant or plants in the state of Mississippi. This project upon completion will be the first cement plant in that state. Definite plans of the company will be made public within a short time.

The charter granted the company is extremely broad, permitting the incorporators to engage in nearly every sort of enterprise except as a common carrier. The incorporators are:

C. K. Taylor, Magnolia, Miss.; M. T. Bynum, Jackson, Miss.; Hugh K. Mahon, Jr., Meridian, Miss.; A. L. Goodman, Starkville, Miss.; R. H. Pate, Jackson, Miss.

Plans for Georgia Cement Plant Nearing Completion

PLANS for going ahead with the construction of the new cement plant contemplated by the Georgia Portland Cement Co. of Augusta, Ga., are rapidly nearing completion, according to a recent announcement made in the Augusta (Ga.) *Chronicle*. Immediate construction of the first unit of two kilns is to be started, with provision for a third kiln later.

Articles of incorporation for the Georgia company were filed at Dover, Del., and announced in the April 3 issue of Rock Products. Further information regarding the company's plans appeared in the September 18 issue. The capital stock is $3,000,000. Headquarters will be in Augusta and the plant will be constructed near Saundersville, it is stated.

Local capital is largely interested in the undertaking, and the company is headed by J. Lee Hankinson as president; John C. Hagler, vice president; D. M. Lyon, vice president; H. T. Hill, treasurer, and J. C. McAuliffe, secretary.

It is understood that a number of capitalists are sponsoring the organization and a full board of directors will be announced in the near future. In the meantime the company has been granted full charter powers and authority granted by the Georgia state securities commission for the offerings of the stock to be made in the state. D. L. Tarjan & Co., of Chicago, are named as fiscal agents.

The formation of the company has been in process for several months, thorough preliminary surveys covering every detail of the work having been carried on under the management of H. K. Ferguson & Co., mining and construction engineers of Cleveland, Ohio. The company has acquired extensive real estate holdings, representing an investment of approximately $100,000, it is said, and including limestone, clay and shale deposits pronounced highly suitable for manufacturing portland cement.

It is stated that the plant will be designed to manufacture 1,000,000 bbl. of cement annually, or a daily output of about 3000 bbl. It will have shipping facilities over the Central of Georgia railroad, the Georgia & Florida railroad, the Sandersville and Tennville, connecting directly with the Wrightstown & Tennville to points south.

Northwestern Portland Cement Breaks Ground for New Plant

GROUND for the new $1,250,000 cement plant of the Northwestern Portland Cement Co., at Grotto, Wash., plans for which were announced in the March 6 issue of Rock Products, was broken recently, according to the Everett (Wash.) *Herald*. The clearing will be rushed, it is said, so that construction of the plant can be started by January 1. President George MacDonald states that the company expects to start actual manufacture by May 1. A staff of from 100 to 150 men will be employed.

The company owns about 635 acres at Grotto, of which 315 acres is in quarry and 320 acres in mill and town site. The location is 49 miles east of Everett on the main line of the Great Northern railroad and on the Stevens Pass highway.

Construction plans indicate a manufacturing plant of approximately 1500 bbl. a day. The factory will use the wet process system with one large kiln. Large grinding units will be installed. All raw materials and clinker will be stored in one building of shed type construction equipped with overhead electric hoist and traveling crane with clamshell bucket attachment. Owing to the proximity to the Great Northern, only short spur tracks will be required. The limestone will be handled by steam shovels and conveyed to the factory by an aerial tramway 8000 ft. long.

Davenport Plant of Dewey Portland Progressing

F. E. TYLER, president and general manager of the Dewey Portland Cement Co., Kansas City, Mo., advises that splendid progress is being made on its new plant now under construction at Davenport, Ia., despite the late excessive rains, which interfered greatly with the building schedule.

Most of the concrete work is finished, covering foundations and buildings, and a considerable amount of machinery has arrived, including boilers, grinding mills, kilns, crushers, etc. The structural steel work on the plant is being done by the McClintic-Marshall Co., Pittsburgh, as announced in a recent issue of Rock Products.

It is hoped to have the plant in operation shortly after the first of the year, Mr. Tyler says, although much depends on the weather. The mill, when completed, will be a $2,000,000 project.

Morgan New Vice-President of Texas Portland

AT a recent meeting of the board of directors of the Texas Portland Cement Co., Dallas, Tex., E. S. Morgan was elected vice president of the company. He will be in charge of all departments of the company with the exception of the treasury department, which will remain under the supervision of J. A. Wheeler.

Mr. Morgan recently returned from South America, where he was in charge of the Interational Cement Corp. plants in Argentina and Uruguay.

New Big Lake Stone Carrier to Have Electric Self-Unloader

FOLLOWING the success of the S.S. *T. W. Robinson*, the Bradley Transportation Co., a subsidiary of the Michigan Limestone and Chemical Co., of Rogers City, Mich., has decided to put in service another boat of the same type. The *T. W. Robinson*, the only boat of its kind in the world, went into service in July, 1925, and has been operating successfully since that time. It embodies the first application of turbine-electric drive to a bulk freighter.

On the *T. W. Robinson*, with a relatively high pressure, high superheat, water-tube boiler installation using stoker firing, there was also installed turbine-electric drive with a motor direct connected to the propeller shaft. All maneuvering is done from a simple control stand located alongside the main turbine generator. Electrification has been carried out almost entirely for the engine room auxiliaries, deck auxiliaries and galley equipment.

The second boat will be much larger. It will be built by the American Shipbuilding Co. and will be used in the same service—transporting limestone from the plant of the Michigan Limestone & Chemical Co. to various ports on the Great Lakes. Turbine-electric drive will be used, similar to that on the *T. W. Robinson*, but of greater horsepower. There will also be a more complete electrification of the auxiliaries. The General Electric Co., who supplied the generating, propulsion and the majority of the auxiliary electrical equipment on the *T. W. Robinson*, will also furnish the power plant, propulsion motor and electrical auxiliary equipment for the new boat.

New Portland Cement Plant Planned in Italy

AN Italian firm is constructing a new cement factory at Bagnoli, Italy, which will operate in connection with its iron and steel mills, according to Consul Harold D. Finley, Naples, writing in *Commerce Reports*. The factory, which will be completed about January 1, 1927, will produce about 200 tons of portland cement per day. The mill has been designed so that it may later be expanded to a 400-ton per day capacity.

Current Abstracts of Foreign Literature

Lime Cements—Waste lime from the Leblanc process for making soda and which has been exposed to the atmosphere is heated to a temperature of 1000 to 1500 deg F. and then ground up to form a cement. A small quantity of alum, potash, or borax is added either before or after heating, or ground glue is added after heating.—*British Patent No. 253,448.*

Cement and Lime Burning Process. A dry powdered mixture of cement or lime forming materials is projected into the calcining region of a combustion chamber maintained at a vitrifying temperature by means of a flaming jet of oil or powdered fuel. The proportions of the fuel and of the cement materials are such that the ash of the fuel is negligible in comparison with the amount of cement or lime that is produced. *British Patent No.* 252, 780.

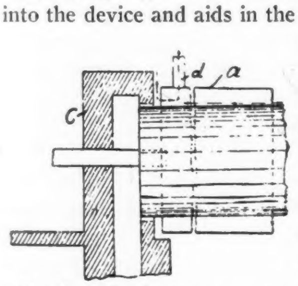
Thermal Behavior of Puzzuolana Cement and Reaction with Alkaline Earth Oxides and Carbonates. In the heating of puzzuolana cement two critical points are observed at about 550 and 900 to 1060 deg. C. respectively. As in the case of kaolin chemical changes occur at these points. Puzzuolana cement reacts with barium oxide at the same temperature and manner as alumina and kaolin. It lowers the temperature of dissociation of barium carbonate to the same extent as alumina and kaolin. The behavior of the alumina in puzzuolana cement toward solutions of hydrochloric acid and calcium hydroxide shows the same characteristics as that of free alumina and the alumina of kaolin when these substances have all been heated to the same temperature.

The results appear to indicate the existence of free silica and alumina as the principal constituents of puzzuolana cement and in view of the differences in the behavior of silica and alumina according to their origin and treatment, it would also explain the variation in the mortars formed by treatment with lime. *Gazetta* (1926), **56**, 42-51.

Destruction of Cement Drain Pipes in Soil. Experiments appear to indicate that when cement hardens in air carbon dioxide first combines with the calcium hydroxide, after which the calcium aluminate and then the silicate are decomposed. The silica thus liberated is converted into the insoluble form. When the calcium carbonate in the cement exceeds 75% the pipes are much more easily damaged. From a detailed examination of corroded drain pipe and the soil from which they were removed (sandy loam) it was concluded that the free carbon dioxide in the ground-water is responsible for the destruction of the pipe. The calcium compounds in the cement are first converted into carbonate and then dissolved out in the form of bicarbonate. Magnesium compounds, also, may sometimes take part. *Zeitschrift fuer angewandte Chemie* (1926), **39**, 883-887.

Constitution of Cement. A review of the present state of knowledge of the constitution of cement clinker taking into consideration the system CaO-Al_2O_3-SiO_2 in so far as mixtures rich in lime are concerned has been recently made. The work confirms the existence of the compound $8CaO, Al_2O_3, 2SiO_2$, which has previously been described [see *Berichte* (1912), 387 and (1915), 81]. This compound was considered to be non-existent by Rankin and Wright. (*Berichte* (1912), 491.) Cement clinker contains dicalcium silicate (belite), tricalcium silicate, tricalcium aluminate, the compounds, $5CaO,3Al_2O_3$, $8CaO,Al_2O_3,2SiO_2$ (alite), $2CaO,Fe_2O_3$, celite and free lime. The so-called aluminous cements contain gehlenite, which has the formula of $2CaO,Al_2O_3,SiO_2$. *Zeitschrift fuer Elektrochemie* (1926), **32**, 354.

Apparatus for Burning Cement. Between the housing of the burner, which surrounds the rotary cement kiln and the stationary head of the kiln, a small slit is left, through which the external air is sucked into the device and aids in the burning of the fuel. In the illustration the housing of the burner can be seen at *a* and the stationary head end of the kiln at *c*. The suction support *d* is also shown, the air being drawn through this into the interior of the kiln. *German Patent No.* 431,987.



Suction device on cement kiln

Optical Behavior of the Lime-Silica-Alumina System in Light of Short Wave Length. Various clinkers, slags and melts were examined under the action of the ultra violet light. The behavior of pulverized and non-pulverized silicates, aluminates, etc., was seen to be quite different under this light.

Thus a series of different colors were obtained for various compounds of the lime-silica-alumina system. For example the monocalcium silicate appears to be violet in pulverized form and light violet when coarsely ground. It is interesting to note here that all the silicates and aluminates examined appeared violet under the ultra violet light when examined in the pulverized condition and the difference in color was observed only when the substance was in the coarsely comminuted condition. Both the tricalcium silicate and the tricalcium aluminate appeared grayish green under the ultra violet light while the pentacalcium trialuminate appeared green. Calcium aluminate appeared violet black and the same was true of tricalcium pentaaluminate. Mullite, which is $3Al_2O_3 \cdot 2SiO_2$ appeared greenish violet, gehlenite appeared a light greenish violet and Jaeneckeit appeared a graying green. The formulae of the latter two substances are $2CaO \cdot Al_2O_3 \cdot SiO_2$ and $8CaO \cdot Al_2O_3 \cdot SiO_2$ respectively.

Various melts containing different proportions of lime, silica and alumina were examined and the colors obtained were plotted on a triangular diagram with alumina, silica and lime at each of the apices of the triangle. It was found that darkest colors were obtained with melts which lay closest to the lime apex and as the mixtures approached the other apices, the colors became lighter. The colors were found to vary from a dark violet to a light violet and from a dark red to a light red. It was not, however, possible, to derive any law which connects up the behavior of the melt under the ultra violet ray with its composition. Differences are found from this general behavior but these are thought to be due to the presence of impurities in the melts.

Special tests were made on dicalcium silicate, which was taken out of the furnace in the incandescent condition and placed on an iron plate heated by a Bunsen burner, thus preventing its crumbling away. When the material was taken away from the hot plate, then it soon began to crumble. The substance on the hot plate appeared violet under the ultra violet ray, but when crumbling commenced the color changed to light yellow or ochre yellow and when the product had entirely crumbled, its color became yellow or brick red.

The results obtained suggest that the ultra violet light might prove to be very useful in examining the structural changes that take place in cement and cement materials. *Zement* (1926), 677.

Mineralogy of Monocalcium Aluminate. Monocalcium aluminate, $CaO \cdot Al_2O_3$, is one of the principal ingredients in cement clinker. This forms beautiful cyclic penetration triplets with a pseudo-hexagonal habitus. It crystallizes in the rhombic form just like chrysoberyll, $BeO \cdot Al_2O_3$, to which it is very closely allied and it represents with this the rhombic members of the spinell group. *Zeit. fuer Krystallographie*, **63**, 473-77.

Constitution of Cement. Various investigations on the constitution of cement are described and the work of Sheperd, Rankin and Wright is reviewed. Optical tests are also made on the regular compound $5CaO \cdot 3Al_2O_3$ as well as the double refractive compound $CaO \cdot Al_2O_3$. *Zeit. fuer Elektro-chemie*, **32**, 354-62.

Traffic and Transportation

EDWIN BROOKER, Consulting Transportation and Traffic Expert
Munsey Building, Washington, D. C.

THE following are the latest proposed changes in freight rates up to the week beginning November 8:

CENTRAL FREIGHT ASSOCIATION DOCKET

14339. **Crushed stone** and articles taking same rates, carloads, Spore, Ohio, to New Salem and Fultonham, Ohio. Present rate, 90c and 100c per net ton; proposed, 80c per net ton.

14340. **Sand** (except blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica, carloads, Charleston, W. Va., to Pomeroy, Ohio. Present rate, 115c per net ton; proposed, 80c per net ton.

14364. **Sand,** blast, engine, foundry, glass, molding or silica, carloads, Rynd Farm, Penn., to Meadville, Penn. Present rate, 13c; proposed, 126c per ton of 2000 lb., to apply via P. R. R., Oil City, Penn., Erie R. R.

14365. **Gravel and sand,** other than blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica, carloads, Star Brick, Penn., to Franklin, Penn. Present rate, via N. Y. C. R. R., 17c (P. R. R. G. O. I. C. C. 14425); via Erie R. R., 13c (P. R. R. G. O. I. C. C. 13162). Proposed, 125c per ton of 2000 lb. Route, via Oil City and N. Y. C. R. R. (distance 61 miles); via Corry and Erie R. R. (distance 94 miles).

14367. **Crushed stone, carloads,** Thrifton, Ohio, to Vauces, Ohio. Present rate, 80c per net ton; proposed, 70c per net ton.

14376. **Crushed stone,** carloads, Marble Cliff, Ohio, to Akron, Ohio. Present rate, 100c per net ton; proposed, 90c per net ton.

14382. **Crushed stone** and articles taking same rates, carloads, Spore, O., to Walbridge, Lemoyne, Pemberville, Bradner and Rising Sun, O., Harpster and Morral, O. Present rate, 120c per net ton to Bradner and Rising Sun; 6th class to other destinations. Proposed, 80c per net ton to Walbridge, Lemoyne, Pemberville, Bradner and Rising Sun, O.; 90c per net ton to Harpster and Morral, O.

14383. **Gravel and sand** (other than blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica), carloads, Toledo, O., to Michigan, Pennsylvania, Kentucky and West Virginia. Present and proposed rates (in cents per ton of 2000 lb.).

To—	Pres. rate	Prop. rate
Lapeer, Mich.	138	148
Monroe, Mich.	81	87
Sharon, Penn.	175	185
Louisville, Ky.	230	252
Pt. Pleasant, W. Va.	195	205
Sharpsville, Penn.	175	185
West Middlesex, Penn.	175	185
Wheatland, Penn.	175	185

14384. **Sand** (except blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica) and gravel, carloads, Jamestown and Hadley, Penn., to Clarion, Penn. Present rate, 160c per net ton; proposed, 140c per net ton. The provisions of Combination Tariff 228 to not apply in connection with the proposed rate.

14422. **Crushed stone,** carloads, Melvin, O., to Milan, Ind. Present rate, 17c; proposed, 115c per net ton.

14423. **Sand and gravel,** carloads, from siding of the East Liverpool Sand Co., east of Leetonia, O., to Lisbon, O. Present rate, 80c per ton of 2000 lb.; proposed, 70c per ton of 2000 lb. Route —P. R. R., Leetonia, O., and Erie R. R.

14426. **Sand,** viz., blast, core, engine, filter, fire or furnace, glass, grinding or polishing, loam, molding or silica, carloads, Rynd Farm, Penn., to Grove City, Penn. Route—Via P. R. R., Houston Jct., and B. & L. R. R. Distance 56 miles. Present rate, 17c; proposed, 126c per ton of 2000 lb.

14428. **Sand,** blast, core engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica, carloads, Rynd Farm, Penn., to Franklin, Penn. Present rate—Via Erie R. R., 10c; via N. Y. C. R. R., 17c. Proposed, 113c per ton of 2000 lb. Route—Via P. R. R., Oil City and Erie R. R.; via P. R. R., Oil City and N. Y. C. R. R.

14437. **Crushed stone,** carloads, Ingalls, Ind., to Lapel, Ind. Present rate, 6th class; proposed, 75c per net ton.

14442. **Gravel and sand** (except blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica), carloads, Columbus, Ind., to Lovett, Commiskey, Paris, Deputy, Blocher, Lexington, Nabb, Marysville, Otisco and Charlestown, Ind. Present rate, 6th class; proposed, 90c to Lovett, Ind.; 95c to Commiskey, Paris and Deputy, Ind.; 100c to Blocher, Lexington and Nabb, Ind.; 105c to Marysville and Otisco, Ind., and 110c per net ton to Charlestown, Ind.

SOUTHERN FREIGHT ASSOCIATION DOCKET

29885. **Crushed stone** from Whitestone, Ga., to Natchez, Miss. Present rate, 402c per net ton (Montgomery, Ala., combination); proposed rate on crushed stone, carloads, minimum weight, 90% of marked capacity of car, except when cars are loaded to their visible capacity, actual weight shall govern from Whitestone, Ga., to Natchez, Miss., 315c per net ton, same as rate in effect from Elberton, Ga.

29919. **Crushed stone,** from Blue Ridge, Roanoke, Pembroke, Klotz and Longcor, Va., to Washington, Wilford, Vandemere, West Tarboro, Henrietta, Davistown and Pinetops, N. C. It is proposed to establish the following reduced rates on crushed stone, carloads, minimum weight 90% of marked capacity of car, except when cars are loaded to their visible capacity, actual weight shall govern (in cents per net ton):

To	From: Pembroke, Va. Klotz, Va. Longcor, Va.	Roanoke, Va.	Blue Ridge, Va.
A. C. L. R. R.—			
Washington, N. C.	189	178	176
W. & V. R. R.—			
Wilford, N. C.	194	......	......
Vandermere, N. C.	194	185	185
East Carolina R. R.—			
West Tarboro, N. C.	219	207	207
Henrietta, N. C.	219	207	207
Davistown, N. C.	219	207	207
Pinetops, N. C.	219	207	207

The suggested rates from Roanoke, Va., Pembroke, Klotz and Longcor, Va., are made on basis of the proposed Georgia scale, using the short distance from Roanoke, and from Pembroke, Klotz and Longcor, using the short distance from Klotz, Va.

29935. **Sand and gravel** from Montgomery, Ala., to Dickert, Hinley's Spur, Falmouth, Mile Post 732 and Mile Post 739, Fla. In lieu of present rate of 238c, it is proposed to establish rate of 189c per net ton on sand and gravel in straight or mixed carloads, minimum weight 90% of the marked capacity of car, except when cars are loaded to their visible capacity actual weight will apply, from Montgomery, Ala., to the destinations mentioned, same as rate in effect to Madison, Fla.

29696. **Sand and gravel,** from P. R. V. R. R. stations to Slidell and North Shore, La. Submittal 29696, docketed for October 25 hearing, proposed rate of 70c per net ton on sand and gravel, carloads, from P. R. V. R. R. stations, viz.: Goodyear, Megeehees Crossing and Emery, Miss., to Slidell, La., made in line with rates in effect between other points in the same general territory. It is now proposed to make the same rate applicable to North Shore, La.

30018. **Crushed stone,** from Holton, Ga., to West Farm and Lee, Fla. Present rate, 235c; proposed rate on stone, crushed; stone, rubble; stone screenings, slag, chert, sand and gravel (washed or unwashed), carloads, minimum weight 90% of marked capacity of car, except when cars are loaded to their visible capacity, actual weight will govern, from and to points mentioned, 176c per net ton, made on basis of the proposed Georgia scale.

30050. **Sand and gravel** from Louisville, Ky., and Nashville, Tenn., to Glasgow, Ky., and from Nashville, Tenn., to Oil City and Stovall, Ky. In lieu of present rate of 190c, it is proposed to establish rate of 150c per net ton on sand and gravel, straight carloads, minimum weight 90% of marked capacity of car, except when cars are loaded to visible capacity actual weight shall govern, from Louisville, Ky., and Nashville, Tenn., to Glasgow, Ky., proposed in order to meet competition of quarries located in the neighborhood of Glasgow. It is also proposed to reduce the rate on these commodities from Nashville, Tenn., to Oil City and Stovall, Ky.

30071. **Crushed stone** from Southern Ry. stations, Covesville to Winesap, Va., inclusive, to Alexandria and Potomac Yard, Va., cancellation. It is proposed to cancel the present commodity rates on crushed stone, carloads, from and to points mentioned.

30073. **Limestone,** crushed, from Lime Rock, Fla., to L. & N. R. R. and S. A. L. Ry. stations. In lieu of intrastate mileage or combination rates it is proposed to establish through commodity rates on limestone, crushed, carloads, minimum weight 90% of marked capacity of car, except when cars are loaded to their visible capacity actual weight shall govern, from Lime Rock, Fla., on the following basis: To L. & N. R. R. stations, P. & A. Division, River Junction to Pensacola, Fla., inclusive, on basis of the Georgia-Alabama single line scale of trunk lines, other than the L. & N. R. R., less 10%, and to S. A. L. Ry. stations east of River Junction to Live Oak, Fla., inclusive, on basis of the Georgia-Alabama scale (joint line) of trunk lines, other than the L. & N. R. R., less 10%.

30112. **Limestone or marble,** ground or pulverized, from Buquo and Hot Springs, N. C., Knoxville, Mascot and Strawberry Plains, Tenn., to stations on the A. & W. P., Ga. R. R., W. Ry. of Ala., L. & N. R. R. and N. C. & St. L. Ry. In lieu of present rates as published in So. Ry. I.C.C. Nos. A-9649 and A-9818, it is proposed to establish commodity rates on limestone or marble, ground or pulverized, carloads, minimum weight marked capacity of car, except when car is loaded to full visible capacity actual weight will govern, from the above named origins to stations on the A. & W. P. R. R., Ga. R. R., W. Ry. of Ala., L. & N. R. R. and N. C. & St. L. Ry., made on basis of the carriers' proposed Georgia joint line scale. Statement of present and proposed rates to representative destinations will be furnished.

WESTERN TRUNK LINE DOCKET

496-G. **Limestone, ground,** carloads, from Weeping Water, Neb., to points in Iowa, representative of the situation as shown below. Rates in cents per ton of 2000 lb.:

To (Representative Points)	From: Weeping Water, Neb. Present Rate	Council Bluffs, Ia. Distance	Council Bluffs, Ia. Present Rate	Weeping Water, Neb., Council Bluffs, Combination *
Council Bluffs, Ia.	90	....	......	......
Acley, Ia.	218	197.1	158	218
Albia, Ia.	213	188.2	153	213
Belle Plane, Ia.	230	231.3	170	230
Colfax, Ia.	202	164.8	142	202
Dewitt, Ia.	253	324.5	193	253
Iowa Falls, Ia.	213	186.5	153	213
Manning Ia.	154	66.8	94	154
Shenandoah, Ia.	139	48.2	79	139

*Proposed through rates account contemplated cancellation combination rule Agent Jones' Tariff 228.

Minimum weight, 60,000 lb.

5790. **Lime,** carloads, from East Dubuque, Ill., and other Mississippi River crossings, when originating east of the Illinois-Indiana State Line, to Mason City, Ia. Present rate, 14½c; proposed, 11c. Minimum weight 30,000 lb.

5609. **Lime,** common, hydrated, quick or slaked, from Chicago, Ill., when originating at Woodville, O., to Denver, Colo., and stations taking same rates. Present rate, 33½c; proposed, 31½c; minimum weight 40,000 lb. Present rate, 39½c; proposed, 38c; minimum weight 30,000 lb.

NEW ENGLAND FREIGHT ASSOCIATION DOCKET

11161. **Stone,** crushed (trap rock), minimum weight 90% marked capacity of car, but in no case less than 54,000 lb., from Westfield, Mass., to Framingham, Mass., via B. & A. R. R., 135c net ton (to include N. Y. N H. & H. R. R. switching charges). Reason: To establish same rate from quarries located at Westfield on the B. & A. R. R. as published from quarries located at more distant points in Connecticut.

Sand-Lime Brick Production and Shipments in October

ACCORDING to statistics received direct from 14 sand-lime brick manufacturers located in the United States and Canada, production and shipments of sand-lime brick were above that of the previous month. The number of plants reporting is three less than those furnishing data for the month of September. It is not possible to make any sort of estimate of these plants production, shipping or other data, but even with conservative figuring there leaves little doubt that the month of October showed decided improvement in the sand-lime brick industry. These statistics as compiled represent about one-half of the productive capacity in the United States and Canada.

Prices received for sand-lime brick were somewhat lower than the past month. The following are average prices in October:

	Plant Price	Delivered
Jackson, Mich.	$12.25	$.......
Dayton, Ohio	12.00	15.00
Milwaukee, Wis.	10.50	13.00
Lakeland, Fla.	10.00	14.00
Pontiac, Mich.	13.00	16.00
Hartford, Conn.	14.00	19.00
Minneapolis, Minn.	10.00	12.75@16.50
Toronto, Ont.	13.10	15.60
Michigan City, Ind.	11.00	. ...
Boston, Mass.	13.78	....
Menominee, Mich.	11.00@12.00	14.50
Detroit, Mich.	14.85	17.00
Detroit, Mich.	13.50	16.00

The following table gives comparative statistics for September and October:

	†September	October
Production	*15,626,000	15,218,000
Shipments (rail)	6,663,000	4,804,000
Shipments (truck)	*9,094,000	11,242,000
Stocks	9,877,000	8,313,000
Unfilled orders	18,651,000	18,225,000

*Revised to include statistics for one plant not reporting in September.
†Includes statistics for three more plants than reporting in October.

New business increased appreciably but production was kept about the same level as the past few months. The tendency is apparently to run the plants at part capacity to take care of orders now on hand and perhaps lay in a stock for the spring building season. The Sand Lime Products Co., Detroit, reports that the new Budd Wheel Co. plant has taken over 1,000,000 of their brick in the past three months and the Highland Park municipal building, 125,000 to date. The company will also furnish the brick for the new Detroit Edison Co. warehouse and a large apartment building. Pontiac Brick Co. has been awarded contract to supply the brick for the Oakland county tuberculosis hospital, the new Pontiac plant of the General Motors Corp., a theater at Birmingham, Mich., and a school at Lincoln Park, Mich. One of the higher class buildings of Lakeland, Fla., the new Melton theater, will be built of sand-lime brick supplied by the Lakeland Brick and Tile Co., Lakeland, Fla. There are probably many other new projects into which sand-lime brick is going, but the above are the only ones reported to Rock Products by the manufacturers.

Sand-Lime Brick Association Prepares for Convention

Already the Sand-Lime Brick Association is getting ready to make the next annual meeting to be held on February 1 to 3 in Detroit one of the best in its history. Circular letters have been mailed to association members asking them for suggestions to help make this so. The entertainment will be in charge of Detroit members. The circular announcing the convention contains some excellent advertising material which sand-lime brick manufacturers could use to advantage in a direct-by-mail advertising campaign. The utility and fireproofness of sand-lime brick are well brought out by photographs and text.

New Lime Plant at Rockland Ready to Operate

WE are officially informed by William R. Phillips, who is in charge of the new lime plant of the New England Lime and Portland Cement Co. at Thomaston and Rockland, Me., that the first two kilns of the four-kiln unit will be put in operation on November 18. A description along with several views of the plant as it appeared in April was published in Rock Products, May 1 issue.

Crushed Stone Association Has Two New Committees

PRESIDENT GRAVES of the National Crushed Stone Association has appointed two new committees. One of these is on Welfare and Safety and has the following membership:

N. S. Greensfelder, chairman, Hercules Powder Co., Wilmington, Del.

E. E. Evans, Whitehouse Stone Co., Spitzer Bldg., Toledo, Ohio.

D. C. Souder, France Stone Co., Toledo, Ohio.

L. R. Cartwright, Mid-West Crushed Stone Co., Indianapolis, Ind.

John Rice, Jr., General Crushed Stone Co., Drake Bldg., Easton, Penn.

W. R. Casparis, Casparis Stone Co., Clinton Bldg., Columbus, Ohio.

J. L. Heimlich, Le Roy Lime & Stone Corp., Le Roy, N. Y.

Harry Landa, Landa Rock Products Co., New Braunfels, Texas.

W. W. Adams (co-operating member from U. S. Bureau of Mines).

W. D. Keefer (cooperating member from National Safety Council).

The other committee is on Research and it will act as a clearing house to consider problems and needs of various sections of the country and may act as an advisory council to the bureau of engineering. The membership consists of:

F. C. McKee, chairman, West Penn Cement Co., Oliver Bldg., Pittsburgh, Penn.

A. T. Goldbeck, director, Bureau of Engineering, N. C. S. A., Earle Bldg., Washington, D. C.

C. L. Van Voorhis, Ohio Crushed Stone Assn., Hartman Bldg., Columbus, Ohio.

H. M. Sharp, France Stone Co., 1800 Second National Bank Bldg., Toledo, Ohio

R. J. Hank, Southwestern Division, N. C. S. A., Littlefield Bldg., Austin, Texas.

Prevost Hubbard, Asphalt Assn., 441 Lexington Avenue, New York City.

C. A. Munson, New Haven Trap Rock Co., 67 Church Street, New Haven, Conn.

W. R. Sanborn, Lehigh Stone Co., Kankakee, Ill.

Thomas McCroskey, American Limestone Co., Knoxville, Tenn.

J. W. Stull, Liberty Lime & Stone Co., Rocky Point, Va.

George E. Martin, The Barrett Co., 40 Rector Street, New York City.

The association has been fortunate in securing the services of such men, many of whom are well known beyond the confines of the industry either as authorities on safety work or as engineers.

Pacific Lime to Erect Ready Mixed Mortar Plant

THE Pacific Lime Co., Vancouver, B. C., will erect a ready mixed mortar plant for servicing local contractors, according to a late report. J. F. Mather, general manager of the company, has been visiting in eastern Canada and the United States, inspecting similar plants in the East, and also purchasing equipment for the efficient mixing of mortar on a large scale. The plant will be put in operation as soon as the new machinery arrives at Vancouver. A site and building on Granville Island, Vancouver, has been leased. The building will be remodeled to suit requirements. A fleet of trucks will be used to deliver the mortar, and ready-mixed mortar will be delivered in any quantity.

The company produces about 20,000 tons of high calcium lime and 7000 tons of hydrate from the plants at Blubber Bay and Esquimalt, B. C. E. D. Kingsley is president; S. J. White, secretary, and J. T. Manson, vice president. Sales offices are located at Vancouver, B. C., Seattle, Wash., Portland, Ore., and San Francisco, Calif.

Cement Labor Efficiency Increases

FIGURES given out by the United States Labor Department recently, according to the *New York Sun*, show that there has been considerable increase in the efficiency of American workers since 1914. The department cites specifically the advance made in several industries. Among these, it is interesting to note, appears the manufacture of cement, with an increase in labor output of 158%.

Taking a large number of separate industries, the figures indicate that the volume of output per man has increased since 1914 on a range of from 106% to 325%.

Cement Products

TRADE MARK REGISTERED WITH U. S. PATENT OFFICE

New Form of Poured Block Made in Texas

Nel-Stone Co. of San Antonio Operates with Simple but Efficient Equipment

NEL-STONE is a form of poured concrete block which is being made in large quantities by the Nel-Stone Co. of Texas, which has its plant in San Antonio. It is also one of those blocks made with a cavity through which reinforcing rods are run, the cavity later being filled with concrete grout to hold the rods firmly in place and protect them from the elements.

The block has an exposed face 12 in. square. The opposite face of the same size, which is to be covered with plaster (without lathing or furring, if desired), is roughened to hold the plaster. This roughened side may be used to hold exterior stucco if desired.

The edges of the block are concaved so that when two edges are placed together a cylindrical hole is made. Reinforcing rods may be run through these holes where this is necessary to add to the strength of the structure.

The molds in which the blocks are formed are carried on a car so that 24 blocks may be poured at the same time. When the molds are full the car with the molds is pushed into a dry house and the blocks are left in the mold for 24 hr. At the end of this period they are hard enough to handle without taking any especial pains to keep from breaking them, and they are piled in a yard. Here they are cured by sprinkling occasionally for about 20 days and at the end of that time they are ready to be laid in the wall. The company recommends the block 6 in. thick for the lower stories and 5 in. thick for upper stories in building ordinary two-story houses. Eight-inch blocks are also made for walls of heavier construction.

The concrete is made of portland cement, clean sand and clean pebbles running from ⅛ in. to ¾ in. in size. Materials are measured in measuring boxes which are on trucks and which are run under the spout from which the material flows. The bins for aggregate are placed in line, as shown in one of the pictures, in order that the boxes may be filled easily. A different size of box is used for each size of block so that the amount of concrete mixed will fill the molds without waste.

A Blystone mixer is used and the concrete is run to the molds through a broad spout, the width of the mixer.

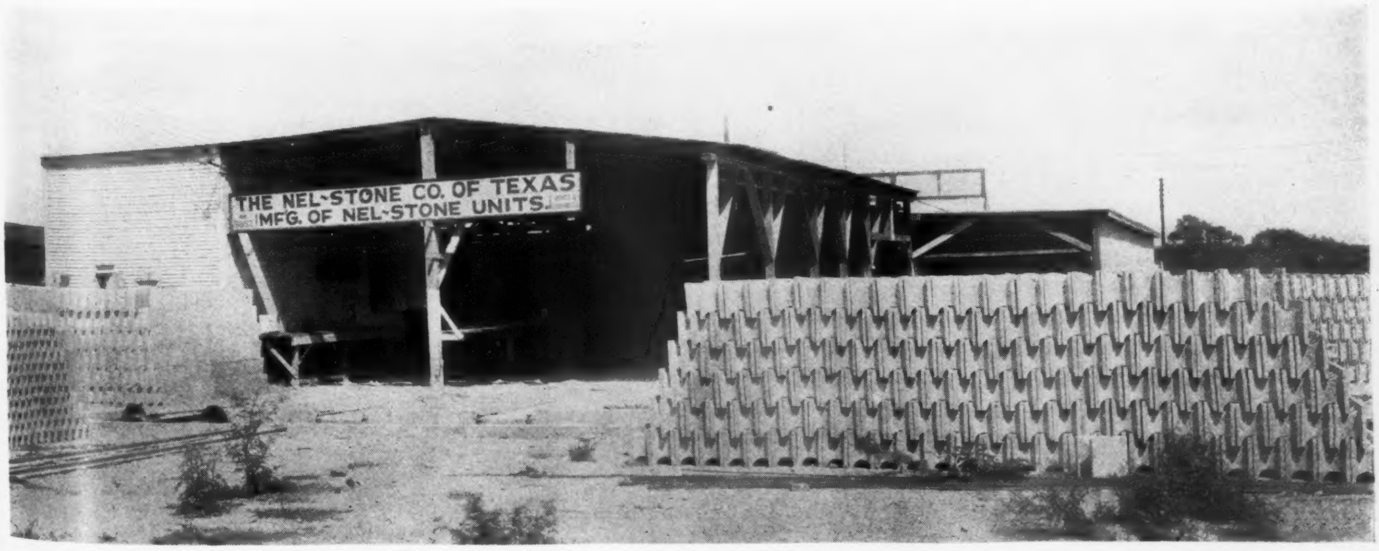
The cars were constructed by a manufacturing company in San Antonio and the molds are made of sheet metal. Formerly wood molds were used, but steel has been found better, as it eliminates the danger of warping.

The cars have corrugated wheels, which is something of an innovation in the cement products industry. The effect of running the cars on corrugated wheels is to subject the molds to many slight jars so that the concrete is settled into the molds and voids are eliminated.

The curing room into which the cars are pushed is 90 ft. long and it is kept at an even temperature which is never allowed to fall below 75 deg. F. Heat is needed for this only a few months in the year in a climate like that of San Antonio.

In addition to Nel-Stone building units the company makes a curbing which is reinforced with ¼-in. steel.

As the company's product is comparatively

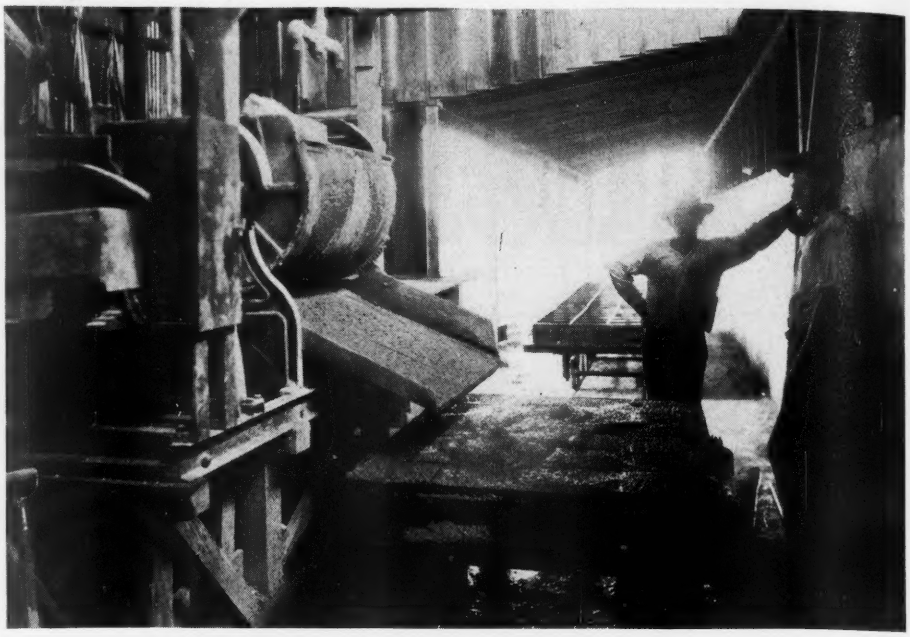


Plant and stone yard of the Nel-Stone Co., San Antonio, Tex. The peculiar form of poured tile are shown in the pile at the right

new, and in order to be sure that it is properly handled, the company contracts for exterior walls and builds them under the supervision of a trained foreman.

Hanibal Pianti is president of the company and the other directors are Eugene Holmgreen, James Kapp, Roy Beitel and A. Girodetti. James Kapp is vice president and A. Girodetti is secretary-treasurer.

A recent story in the *San Antonio Light* states that a second dry room is to be built by the company and that this addition is justified by the advance orders already received. Mr. Girodetti said in an interview that the plant had been running to capacity for several months and that the company would enlarge production facilities in order to accumulate a stock for rush delivery during the busy season.



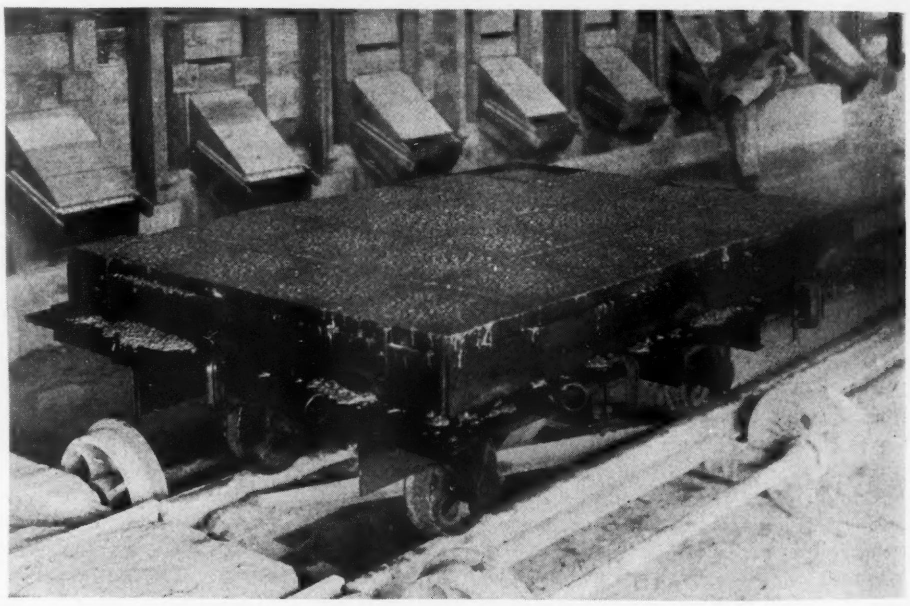
Mixer and car of molds just filled

Maine Cement Products Plant Adds Laundry Tubs to Line

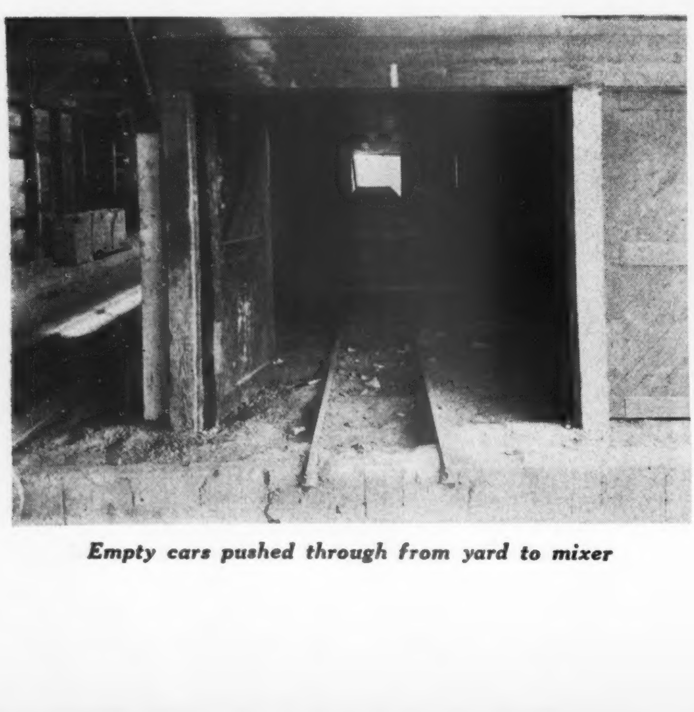
JANELLE AND BELISLE CO., Lewiston, Me., manufacturers of cement blocks, fancy post tops, flowerpots and other fancy cement articles, has started the manufacture of a two-compartment laundry tub, called the Perfection Laundry Set Tubs, according to a recent announcement in the Lewiston (Me.) *Journal.*

The tubs, while similar to the slate tubs, are made of portland cement concrete using crushed granite aggregate and cast in one piece. Around the top edge of the tub is a border of zinc which helps the appearance, makes it smooth, and keeps the edge of the tub from chipping off. The company expects to furnish these tubs to local wholesale plumbers and in time branch out to other places.

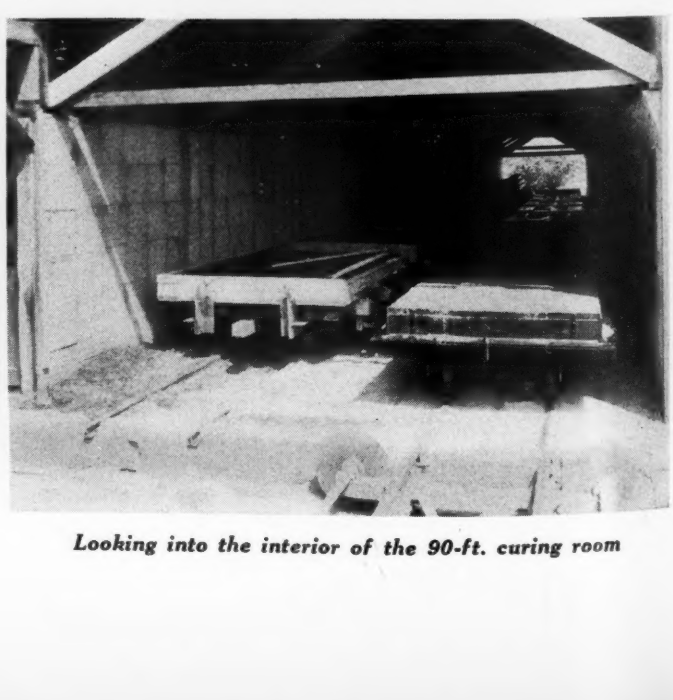
The Janelle and Belisle Co. was founded about four years ago, and consists of Avarriste Janelle, Oliver Janelle, his son, and J. A. Belisle. They started in a small way, but have been expanding steadily. The cement blocks they manufacture are made in several different patterns and are much in demand locally.



Car with corrugated wheels bearing the filled mold



Empty cars pushed through from yard to mixer



Looking into the interior of the 90-ft. curing room

Hoover Concrete Building Unit Code Saved Florida Millions

AFTER an exhaustive study of the effect of the Florida hurricane on houses and other structures in its path William M. Kinney, general manager of the Portland Cement Association, warmly praised the building standards of the U. S. Department of Commerce as a practical means of minimizing in the future the effects of such catastrophies. Mr. Kinney has been a close student of building methods and a member of leading American technical societies for nearly twenty years.

"We have refrained from talking about Florida up to this time," said Mr. Kinney, "through a desire to wait until a thorough examination could be made and reports received from engineers sent to the scene. Unfortunately, some of the earlier statements gave the building public quite an inaccurate picture.

"Practical builders look upon any storm which approaches the intensity of the recent hurricane as almost beyond the range of human power to foresee or provide against. We are told that the barometer went lower than was ever recorded in the United States. The wind, whirling along at 130 miles per hour, drove great waves seven to fifteen feet high over the area, undermined structures and drove marine craft and other heavy floating objects against the buildings with incalculable force. Seven to fifteen inches of rain fell in a few hours. While experience in previous extreme tests justified experts in their opinion that reinforced concrete construction would meet the test perfectly as it did in this case, that dwellings in any great number should withstand the onslaught may be considered remarkable.

"Therefore it is a very gratifying fact that domestic structures built in accordance with the building code of the U. S. Department of Commerce came through the storm almost undamaged. Certainly no stronger endorsement of the expert work rendered by Secretary Hoover's code committee can be found than in the examination of structures known to have been built according to its requirements for residential construction.

"The most striking example in the entire storm area is found at Coral Gables, where there is a group of about 3,500 residence, apartment and hotel structures, all of which have concrete block walls clad with artistic colored cement stucco. These buildings, erected under the supervision of the Coral Gables architect, in accordance with the Hoover code, came through the storm without a single case of destruction or anything more serious than slight superficial damage. These houses were directly in the path of the hurricane, as shown by the fact that trees and landscaping in the town were damaged to the extent of over a million dollars.

"Judging by the devastation to building in communities surrounding Coral Gables on every side, the property losses prevented by the use of substantial materials and adherence to these well-recognized standards, easily may be placed at twenty-five to fifty million dollars for Coral Gables alone.

"Serious damage or destruction of buildings with walls of various masonry materials occurred to a lamentable extent where slip-shod construction methods were tolerated. In a great proportion of these cases weak lime mortar, which would not be permitted under the Hoover code, is largely to blame. The masonry units are being picked up intact and relaid in the walls. Brick construction was so sparsely used in the storm area that it is hardly a factor."

Filling the measuring boxes from the aggregate bins—Nel-Stone Co., San Antonio, Tex.

Cement Block in Good Demand in Southern Indiana

CEMENT block manufacturers in Evansville and other towns in southern Indiana say that the demand for blocks is growing each year and their volume of business for this year has been much larger than that of last year. The Standard Concrete Co. at Evansville have furnished concrete blocks for a large number of jobs this year and their business is increasing rapidly. The greater part of the blocks go into foundations and garages.

New Alabama Products Plant

THE Muscle Shoals Cement Products Co., Inc., recently organized at Sheffield, Ala., with a capital of $25,000, plans the establishment of a cement products plant there. Erection of adequate buildings will be started at once, according to the Montgomery (Ala.) *Advertiser*.

W. J. Runyon, a local contractor, is president of the new concern; W. S. Estop, Florence, Ala., vice president, and O. P. Green, secretary-treasurer. The directors are W. J. Runyon, W. S. Estop, O. P. Green, John J. Nyhoff, T. M. Rogers, Lindsey Nathan and W. H. Richeson.

The products of the plant will include such cement building materials as bricks, roofing, slabs and a long line of ornamental trimmings.

It is expected that the plant to begin with will employ 25 to 40 men, and a gradual increase in labor will be made as the output is increased.

Spokane Cement Products Plant to Expand

O. N. WOLFF, Spokane, Wash., who has owned and operated a cement products plant in that city for 15 years, is now constructing a new and larger plant to house his factory, says a report in the *Spokesman-Review*.

Mr. Wolff hopes to have the new plant operating within a short time. The new building will be T-shaped, the leg to be 120x40 ft., and the wing 110x40 ft. One building will house the mixing machines, pattern making room and cement, sand and gravel storage; the other will be the molding room.

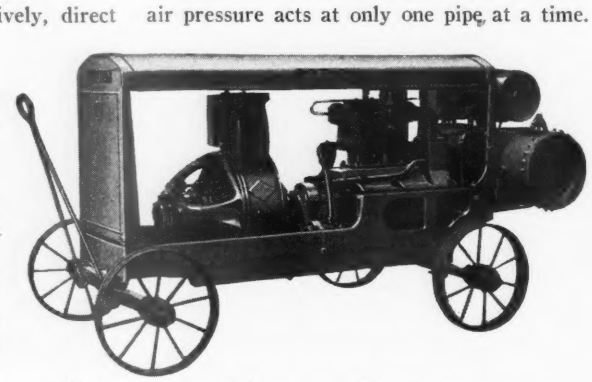
The principal products of the company are artificial stone and ornamental cement products which it ships throughtout the state.

New Machinery and Equipment

New Portable Air Compressors

THE Sullivan Machinery Co., Chicago, Ill., announce two new additions to their line of electric motor-driven portable air compressors, the WK-322 and the WK-324 with rated capacities of 103 and 206 cu. ft. of free air per minute, respectively, direct motor connected to the compressors, the former using a 20-hp. motor and the latter a 40-hp. These two types are identical with the gasoline engine-driven units WK-312 and WK-314 made by the company and are equipped with the corresponding compressor units.

The compressors are mounted on steel wheels but may be mounted, if desired, on a 1-ton truck, trailer truck or skids. Both types are equipped with a.c. or d.c. motors of standard make. The compressors are equipped with Protectometer air filters. The trailer mountings have a drawbar with eyebolt and recoil spring for attaching to motor truck.



Electric motor-driven portable air compressor

New Cement Slurry Agitator

A NEW cement slurry agitator, said to operate on low power and small quantity of air, and to ensure the efficient mixing of raw materials, is announced by the Manitowoc Engineering Works, Manitowoc, Wis. The "Minogue" agitator, as it is called, consists of a device supported on a structural frame work suitable for any size tank. Agitation is obtained through two arms provided with lifting teeth and air pipes, revolving continuously in the bottom of the slurry tank.

A governor valve controls the air admitted to the distributor valve and therefore, it is said, provides for intermittent air agitation at predetermined intervals.

A distributing valve furnishes the full supply of air for a complete revolution to each of the pipes in its proper sequence. This is said to overcome trouble from the pipes plugging and to insure that the air is released in a definite position, since the full air pressure acts at only one pipe at a time.

The feed pipe for air leading to the governor valve has in it for a short length a very small diameter pipe, about 3/8 in., depending on size of tank, whereas the feed pipe itself is 1½ in. The constricted area limits the amount of air consumed and at the same time, it is said, provides for building up the pressure to the compressor capacity should it be required.

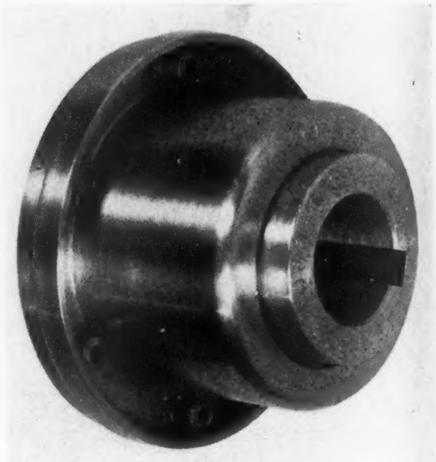
Electric Device for Measuring Moisture in Sand

R. W. McILWAINE CO., Chicago, Ill., have recently developed an electrical device for measuring the moisture in sand. Although intended for foundry practice, it can be adapted for use with common sand. A direct reading of the relative moisture is obtained by thrusting the lower end of the barrel of the device into the sand heap. If results in per cent are desired, a sample of the sand is sent to the manufacturer and a calibration curve showing direct readings will be supplied.

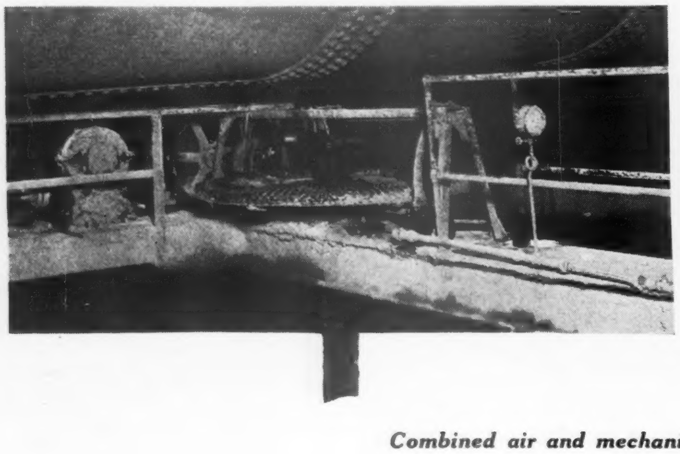
New Flexible Coupling

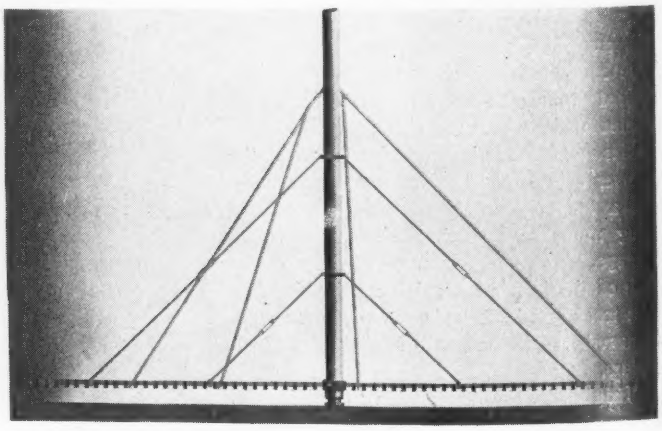
A NEW all steel flexible coupling positively lubricated for direct connection to the driving unit is announced by the Falk Corp., Milwaukee, Wis. The construction of the coupling is said to provide for disconnection of shafts coupled without disturbing either machine. Alignment, it is said, is also reduced to a simple operation, requiring only a short straight edge and an ordinary set of feelers.

The coupling consists of a steel shell which holds a tempered steel spring in segments and two flanged steel discs with slots into which the spring fits. The shell protects the coupling parts from dirt, acts as a fastener for the spring and as a container for lubricant. The standard sizes of this coupling as made range from 1/3 to 20,000 hp. at 100 r.p.m.



All steel flexible coupling



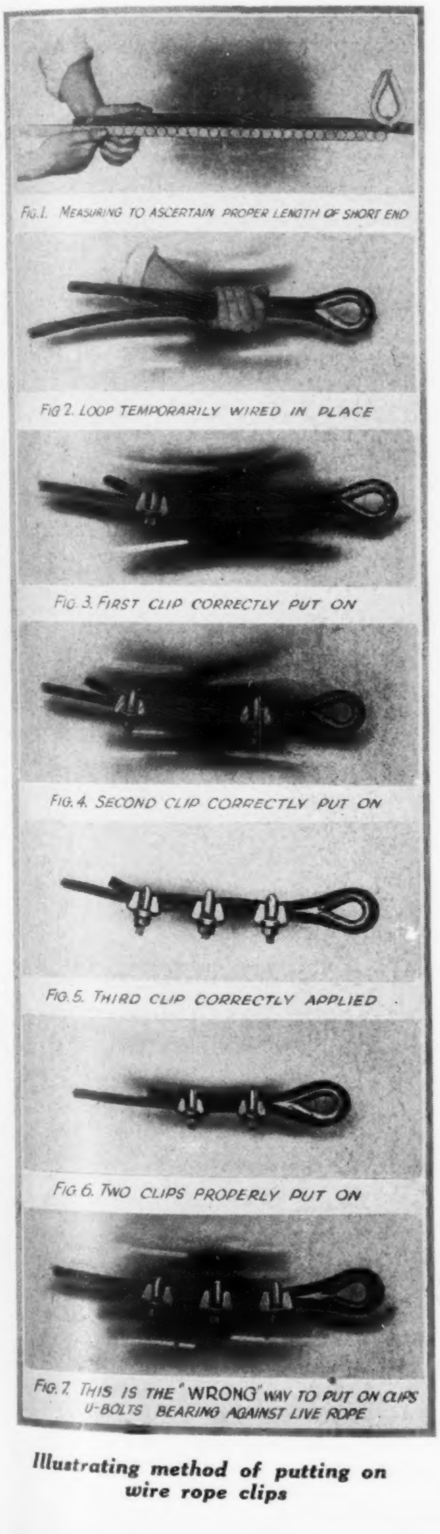


Combined air and mechanical agitator for cement slurry

Putting Wire Rope Clips On Properly

THE American Hoist and Derrick Co., St. Paul, Minn., have prepared a simple set of rules covering the correct application of wire rope clips. This method, which is illustrated below, is based upon experiment and practical use over many years in the field. It has been found very effective and satisfactory. The following description shows how and why clips should be applied with all bases on the live rope. The clips shown in the illustrations are Crosby clips.

The rules to be observed are:



Illustrating method of putting on wire rope clips

1. Before cutting a wire rope wind both sides of the contemplated cut with wire to prevent it from untwisting.

2. Always use a thimble in the loop of the rope except when rope is carried around some object of sufficiently large diameter to prevent fracture of wires.

3. Allow 30 diameters of the rope from the center of the loop to the wired end. With a ¾-in. rope this amounts to a little more than 22 in. and with a ⅞-in. rope it is about 26 in.

4. With the thimble wired in place it is an easy matter to bend the loop around a short post or rod. It is good practice to wire the loop in place until the clips are securely applied. A simple method of doing this is illustrated in Fig. 2.

5. The number of clips to be used depends on the maximum capacity of the rope. The fewest that should be used on running ropes is two at each loop, though it is better to put on an extra one. For guy ropes, three clips should be used.

6. It is important that the "live" or long rope rest upon the broad bearing surface of the base of the clip, as the pressure of the "U" bolt on the "live" rope might tend to cut it. Many installers make a practice of staggering the clips; that is placing one with the base bearing against the "live" rope, the next with the U-bolt against the live rope, and so on. This is very bad practice. Those who do it claim that it gives a more secure fastening, but this is doubtful. A wire rope vibrates and whips about more or less while working, and if the U-bolts of the clips which fasten it are bearing against the "live" rope, their narrower bearing surface may in time induce a break. This would not occur if the base, with its broad bearing area, were resting against the "live" rope.

7. The clip farthest from the loop should be applied first, at a distance of approximately 4 in. from the wired end of the rope. See Fig. 3. This clip should be turned up tight when it is first put on. The clip nearest the loop should be put on next, 4 in. from the loop. See Fig. 4. If placed too close to the loop it will shorten the bending angles of the rope and the wires are more in danger of fracture; it must not however be placed so far away as to allow the thimble to drop out. The nuts of this clip should not be turned up as tight as they will go when the clip is first put on.

If three clips are to be used, the third one should be applied last, half-way between the other two. See Fig. 5. Before completely tightening these last two clips, it is desirable that some stress be placed upon the rope. This will take up the slack and equalize the tension on all three clips and is an important operation. After this has been done the last two clips should be tightened up thoroughly. It is possible to tighten the clips securely without undue pressure on the wrench.

8. Clips should be put on perfectly straight. Any twist or crookedness will place the clip at a disadvantage and impair its holding power.

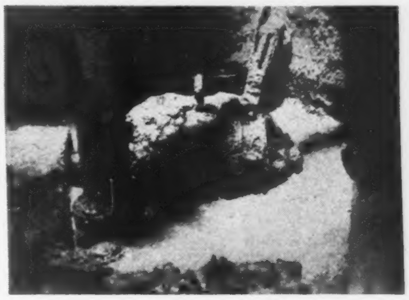
The nuts must be tightened uniformly, each given a few turns alternately.

9. It is a wise practice to oil the threads in both the bolt and nut before tightening. This permits the clip to be screwed on more easily and securely.

10. Even after the clips have been applied and tightened up properly, the tightening operation must be repeated after the rope has carried a load for some time, because stress always reduces rope diameter.

Sealed Motor Withstands Hard Test

AS proof of the durability of sealed sleeve bearing electric motors, the Westinghouse Electric and Mfg. Co., East



Electric motor buried in slurry pit

Pittsburgh, Penn., furnishes the following experience at the Monolith Portland Cement Co.'s plant at Monolith, Calif. This company uses a Westinghouse motor of this type to drive a 6-in. Wilfley centrifugal pump for handling slurry.

One day and for apparently no reason at all an auto starter kicked out from overload. Upon investigation to discover the reason for this it was found that the pump had blown out a gasket, but the motor had continued to operate. The result was that the pit became filled with slurry and the motor completely buried, with only a portion of the eyebolt showing.

The pit was emptied immediately and the motor washed with a hose and water. Without changing the oil the motor was started up and the report states that it has been running ever since.

Robins Buys Hewitt Interests

THE Robins Conveying Belt Co., New York, with plant at Passaic, N. J., has acquired a controlling interest in the Hewitt Rubber Co., Buffalo, manufacturer of mechanical rubber products, and its subsidiary, the Gutta Percha & Rubber Mfg. Co., lately purchased by the Hewitt company, previously located at Brooklyn. The new owner will develop the local plant for its mechanical rubber and belt-manufacturing requirements and plans extensive production. Thomas Robins, president of the purchasing company, will be chairman of the boards of the two acquired companies.

The Rock Products Market

Wholesale Prices of Crushed Stone

Prices given are per ton, F.O.B., at producing point or nearest shipping point

Crushed Limestone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:						
Buffalo, N. Y.	1.30	1.30	1.30	1.30	1.30	1.30
Chaumont, N. Y.	.50	1.75	1.75	1.50	1.50	1.50
Chazy, N. Y.	.75	1.65	1.65	1.40	1.40	1.40
Cobleskill, N. Y.	1.50	1.35	1.25	1.25	1.25	
Danbury, Conn.	1.50@2.00	2.00	1.75	1.50	1.35	1.25
Dundas, Ont.	.53	1.05	1.05	.90	.90	.90
Frederick, Md.	.50@ .75	1.20@1.30	1.15@1.25	1.10@1.15	1.10@1.15	1.05@1.10
Munns, N. Y.		1.00	1.50	1.50	1.25	1.25
Northern New Jersey	1.60	1.50@1.80	1.30@2.00	1.40@1.60	1.40@1.60	
Prospect, N. Y.	1.00	1.50	1.40	1.30	1.30	
Walford, Penn.	.70		1.35h			
Watertown, N. Y.	1.00		1.75	1.50	1.50	1.50
Western New York	.85	1.25	1.25	1.25	1.25	1.25
CENTRAL						
Afton, Mich.				.50	1.50	1.50
Bloomville. Middlepoint, Dunkirk, Bellevue, Waterville, No. Baltimore, Holland, Kenton, New Paris, Ohio; Monroe, Mich.; Huntington, Bluffton, Ind.	1.00	1.10	1.10	1.00	1.00	1.00
Buffalo and Linwood, Iowa	1.00		1.10	.90	.95	.95
Carey, Ohio	1.05	1.05	1.05	1.05	1.05	1.05
Chasco, Ill.	1.00@1.30		1.00@1.15		1.00@1.15	
Columbia and Krause, Ill.	1.00@1.50	.90@1.10	1.20@1.35	1.00@1.20	.90@1.20	
			Flux 1.50@1.75			
Greencastle, Ind.	1.25	1.25	1.15	1.05	.95	.95
Lannon, Wis.	.80	1.00	1.00	.90	.90	.90
Linwood, Iowa	1.10		1.30	1.10	1.15	1.15
McCook, Ill.	1.00	1.25	1.25	1.25	1.25	1.25
Milltown, Ind.		90@1.10	.90@1.15	.90@1.00	.85@.90	.85@.90
River Rouge, Mich.	1.20	1.20	1.20	1.20	1.20	1.20
St. Vincent de Paul, Que.	.75	1.20@1.45	.90@1.15	.90@ .95	.85	.85
Sheboygan, Wis.	1.10	1.10	1.10	1.10	1.10	1.10
Toledo, Ohio	1.60	1.70	1.70	1.60	1.60	1.60
Toronto, Ont.	1.55	2.05	2.05	1.90	1.90	1.90
Stone City, Iowa	.75		†1.10	1.05	1.00	
Waukesha, Wis.	1.10		.90	.90	.90	.90
SOUTHERN:						
Alderson, W. Va.	.50	1.35	1.35	1.25	1.20	1.15
Atlas, Ky.		1.00	1.00	1.00	1.00	1.00
Brooksville, Fla.	.75		2.65	2.65	2.40	2.00
Cartersville, Ga.	1.00	1.50	1.50	1.15	1.15	
Chico, Tex.	1.00	1.35	1.25	1.20	1.10	1.00
El Paso, Tex.	1.00	1.00	1.00	1.00		
Ft. Springs, W. Va.	.50	1.35	1.35	1.20	1.20	
Graystone, Ala.			Crusher run, 1.00 per ton			
Kendrick and Santos, Fla.			3½ in. and less, 1.00 per ton			
New Braunfels, Tex.	.60	1.25	1.10	.90	.90	.90
Rocky Point, Va.	.50@ .75	1.40@1.60	1.30@1.40	1.15@1.35	1.10@1.20	1.00@1.05
WESTERN:						
Atchison, Kans.	.25	1.90	1.90	1.90	1.90	1.80
Blue Springs & Wymore, Neb.	.25	1.45	1.45	1.35c	1.25d	1.20
Cape Girardeau, Mo.	1.25		1.25	1.25	1.10	
Kansas City, Mo.	.75	1.50	1.50	1.50	1.50	1.50
Rock Hill, St. Louis Co., Mo.	1.40	1.45	1.45	1.45	1.45	1.45

Crushed Trap Rock

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Branford, Conn.	.80	1.70	1.45	1.20	1.05	
Duluth, Minn.	.90	2.25	1.90	1.50	1.35	1.35
Dwight, Calif.	1.00		1.00	.90	.90	
Eastern Maryland	1.00	1.60	1.60	1.50	1.35	1.35
Eastern Massachusetts	.85	1.75	1.75	1.25	1.25	1.25
Eastern New York	.75	1.25	1.25	1.25	1.25	1.25
Eastern Pennsylvania	1.10	1.70	1.60	1.50	1.35	1.35
Knippa, Texas	2.50	2.00	1.55	1.25	1.15	1.15@1.50
New Haven, New Britain, Meriden and Wallingford, Conn.	.80	1.70	1.45	1.20	1.05	1.05
Northern New Jersey	1.60	2.10	1.90	1.50	1.50	
Oakland and El Cerito, Cal.	1.00	1.00	1.00	.90	.90	
San Diego, Calif.		2.75	2.55	2.35	2.35	
Springfield, N. J.	1.70	2.10	2.10	1.70	1.60	
Toronto, Ont.		3.58@4.05	3.05@3.80			
Westfield, Mass.	.60	1.50	1.35	1.20	1.10	

Miscellaneous Crushed Stone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Berlin, Utley, Montello and Red Granite, Wis.—Granite	1.80	1.70	1.50	1.40	1.40	
Coldwater, N. Y.—Dolomite			1.50 all sizes			
Columbia, S. C.	.75	2.00	1.75	1.75	1.60	1.60
Eastern, Penn.—Sandstone	1.35	1.70	1.65	1.40	1.40	1.40
Eastern Penn.—Quartzite	1 20	1.35	1.25	1.20	1.20	1.20
Lithonia, Ga.	.75	2.00b	1.75	1.40	1.40	1.25
Lohrville, Wis.—Granite	1.65	1.70	1.65	1.45	1.50	
Middlebrook, Mo.	3.00@3.50		2.00@2.25	2.00@2.25		1.25@3.00
Richmond, Calif.—Quartzite	.75		1.00	1.00	1.00	
Somerset, Pa. (sand-rock)	**1.85@2.00a**		**1.35@1.50**		**1.00@1.50**	
Toccoa, Ga.		1.35		1.30	1.30	1.25

*Cubic yd. †1 in. and less. ‡Two grades. ‖Rip rap per ton. (a) Sand. (b) to ⅛ in. (c) 1 in., 1.40. (d) 2 in., 1.10 (e) Dust. (f) ¼ in. (h) less 10c discount. (i) 1 in., 1.40.

Agricultural Limestone

(Pulverized)

Alderson, W. Va.—50% thru 50 mesh	1.50
Alton, Ill.—Analysis 99% $CaCO_3$, 0.3% $MgCO_3$; 90% thru 100 mesh	6.00
Asheville, N. C.—Analysis, 57% $CaCO_3$, 39% $MgCO_3$; 50% thru 100 mesh; 200-lb. burlap bag, 4.00; bulk	2.75
Atlas, Ky.—90% thru 100 mesh	2.00
50% thru 100 mesh	1.00
Belfast and Rockland, Me. (rail), Lincolnville, Me. (water), analysis $CaCO_3$ 90.04%; $MgCO_3$ 1.5%, 100% thru 14 mesh, bags	4.50
Bulk	3.50
Bettendorf and Moline, Ill.—Analysis, $CaCO_3$, 97%; 2% $MgCO_3$; 50% thru 100 mesh, 1.50; 50% thru 4 mesh	1.50
Blackwater, Mo.—100% thru 4 mesh	1.00
Branchton and Osborne, Penn.—100% thru 20 mesh; 60% thru 100 mesh; 45% thru 200 mesh. (Less 50 cents commission to dealers)	5.00
Cape Girardeau, Mo.—Analysis, 93% $CaCO_3$, 3.5% $MgCO_3$; pulverized; 50% thru 50 mesh	1.50
Cartersville, Ga.—Pulverized, 2.00; 50% thru 50 mesh	1.50
Chaumont, N. Y.—Pulverized limestone, bags, 4.00; bulk	2.50
Chico, Texas.—50% thru 50 mesh, bulk	1.50
Colton, Calif.—Analysis 90% $CaCO_3$, bulk	4.00
Cypress, Ill.—90% thru 100 mesh	1.35
Ft. Springs, W. Va.—50% thru 4 mesh	1.50
Hillsville, Penn.—Analysis, 94% $CaCO_3$, 1.40% $MgCO_3$; 75% thru 100 mesh; sacked	5.00
Jamesville, N. Y.—Analysis, 89.25% $CaCO_3$; 5.25% $MgCO_3$; pulverized, bags, 4.25; bulk	2.75
Joliet, Ill.—90% thru 100-mesh	4.25
Knoxville, Tenn.—80% thru 200 mesh, 3.00; 80% thru 100 mesh, bags, 3.95; bulk	2.70
Marblehead, Ohio—Analysis, 83.54% $CaCO_3$, 14.92% $MgCO_3$; 60% thru 100 mesh; 70% thru 50 mesh; 100% thru 10 mesh; 80 lb. paper sacks, 5.00; bulk	3.50
Marion, Va.—Analysis, 90% $CaCO_3$, pulverized, per ton	2.00
Mayville, Wis.—Analysis, 54% $CaCO_3$, 44% $MgCO_3$; 90% thru 100 mesh	3.90@ 4.50
Middlebury, Vt.—99% thru 50 mesh, 50% thru 200 mesh	2.00
Milltown, Ind.—Analysis, 94.50% $CaCO_3$, 33% thru 50 mesh, 40% thru 50 mesh; bulk	1.35@ 1.60
Olive Hill, Ky.—50% thru 50 mesh, 2.00; 90% thru 4 mesh	1.00
Piqua, Ohio—Total neutralizing power 95.3%; 99% thru 10, 60% thru 50; 50% thru 100	2.50@ 2.75
100% thru 10, 90% thru 50, 80% thru 100; bags, 5.10; bulk	3.60
99% thru 100, 85% thru 200; bags, 7.00; bulk	5.50
Rocky Point, Va.—Analysis, $CaCO_3$, 95%; 50% thru 200 mesh, burlap bags, 3.50; paper, 3.25; bulk	2.00
Syracuse, N. Y.—Analysis, 89% $CaCO_3$; $MgCO_3$, 4%; bags, 4.25; bulk	2.75
Toledo, Ohio, 30% through 50 mesh	2.25
Waukesha, Wis.—90% thru 100 mesh, 4.50; 50% thru 100 mesh, 2.10; 90% thru 50 mesh	1.65
Watertown, N. Y.—Analysis, 96-99% $CaCO_3$; 50% thru 100 mesh; bags, 4.00; bulk	2.50
West Stockbridge, Mass.—Analysis 90% $CaCO_3$, 50% thru 100 mesh; cloth bags, 4.75; paper, 4.25; bulk	3.25

Agricultural Limestone

(Crushed)

Alton, Ill.—Analysis 99% $CaCO_3$, 0.3% $MgCO_3$; 50% thru 4 mesh	3.00
Atlas, Ky.—90% thru 4 mesh	1.00
Bedford. Ind.—Analysis, 98.5% $CaCO_3$, 0.5% $MgCO_3$; 90% thru 10 mesh	1.50
Brandon and Middlebury, Vt.—Pulverized, bags, 5.50; bulk	3.50

(Continued on next page)

Agricultural Limestone

Bridgeport and Chico, Texas—Analysis, 94% $CaCO_3$, 2% $MgCO_3$; 100% thru 10 mesh		1.75
50% thru 4 mesh		1.50
Chicago, Ill.—50% thru 100 mesh; 90% thru 4 mesh		.80
Columbia, Krause, Valmeyer, Ill.—Analysis, 90% $CaCO_3$; 90% thru 4 mesh		1.35
Cypress, Ill.—90% thru 50 mesh, 50% thru 100 mesh, 90% thru 50 mesh, 90% thru 4 mesh, 50% thru 4 mesh		1.35
Danbury, Conn.—Analysis, 81 to 85% $CaCO_3$	3.75@	4.75
Dundas, Ont.—Analysis, 53.8% $CaCO_3$; $MgCO_3$, 43.3%; 50% thru 50 mesh		1.00
Ft. Springs, W. Va.—Analysis, 90% $CaCO_3$; 90% thru 50 mesh		1.50
Kansas City, Mo.—50% thru 100 mesh		.75
Lannon, Wis.—Analysis, 54% $CaCO_3$, 44% $MgCO_3$; 99% through 10 mesh; 46% through 60 mesh		2.00
Screenings (¼ in. to dust)		1.00
Marblehead, Ohio.—Analysis, 83.54% $CaCO_3$, 14.92% $MgCO_3$, 32% thru 100 mesh; 51% thru 50 mesh; 83% thru 10 mesh; 100% thru 4 mesh (meal) bulk		1.60
Mayville, Wis.—Analysis, 54% $CaCO_3$, 44% $MgCO_3$: 50% thru 50 mesh	1.85@	2.35
McCook, Ill.—90% thru 4 mesh		.90
Middlepoint, Bellevue, Kenton, Ohio; Monroe, Mich.; Huntington and Bluffton, Ind.—Analysis, 42% $CaCO_3$, 54% $MgCO_3$; meal, 25 to 45% thru 100 mesh		1.60
Moline, Ill., and Bettendorf, Iowa—Analysis, 97% $CaCO_3$, 2% $MgCO_3$; 50% thru 100 mesh; 50% thru 4 mesh		1.50
Monroe, Mich. — Analysis, $CaCO_3$, 52.03%; 42.25% $MgCO_3$; 30% thru 100 mesh		2.30
Mountville, Va. — Analysis, 62.54% $CaCO_3$; $MgCO_3$, 35.94%, 100% thru 20 mesh; 50% thru 100 mesh bags		5.50
Pixley, Mo.—Analysis, 96% $CaCO_3$; 50% thru 50 mesh		1.25
50% thru 100 mesh; 90% thru 50 mesh; 50% thru 50 mesh; 90% thru 4 mesh; 50% thru 4 mesh		1.65
River Rouge, Mich.—Analysis, 54% $CaCO_3$, 40% $MgCO_3$; bulk	.80@	1.40
Stone City, Iowa. — Analysis, 98% $CaCO_3$; 50% thru 50 mesh		.75
Tulsa, Okla.—Analysis $CaCO_3$, 86.15%, 1.25% $MgCO_3$, all sizes		1.25

Pulverized Limestone for Coal Operators

Hillsville, Penn., sacks, 4.50; bulk		3.00
Joliet, Ill.—90% thru 100 mesh		3.50
Piqua, Ohio, sacks, 4.50@5.00 bulk	3.00@	3.50
Rocky Point, Va.—82% thru 200 mesh, 2.50@3.50 bulk, paper bags	3.75@	4.75
Waukesha, Wis.—90% thru 100 mesh, bulk		4.50

Glass Sand

Silica sand is quoted washed, dried and screened unless otherwise stated. Prices per ton f.o.b. producing plant.

Berkeley Springs, W. Va	2.00@	2.25
Buffalo, N. Y	2.00@	2.50
Cedarville and S. Vineland, N. J.—Damp		1.75
Dry		2.25
Columbus, Ohio	1.00@	1.50
Estill Springs and Sewanee, Tenn		1.50
Franklin, Penn.		2.00
Gray Summit and Klondike, Mo.		2.00
Los Angeles, Calif.—Washed		5.00
Mapleton Depot, Penn	2.00@	2.25
Massillon, Ohio		3.00
Mendota, Va.	2.25@	2.50
Mineral Ridge and Ohlton, Ohio		2.50
Oceanside, Calif.		3.00
Ottawa, Ill.	.75@	1.25
Pittsburgh, Penn.	3.00@	4.00
Ridgway, Penn.		2.50
Rockwood, Mich.	2.75@	3.25
Round Top, Md.		2.00
San Francisco, Calif.	4.00@	5.00
Silica, Va.	2.25@	2.50
St. Louis, Mo.		2.00
Sewanee, Tenn.		1.50
Thayers, Penn.		2.50
Utica, Ill.		1.00
Zanesville, Ohio		2.50

Miscellaneous Sands

City or shipping point	Roofing sand	Traction
Beach City, Ohio	—	1.75@ 2.25
Columbus, Ohio	—	.30@ 1.50
Dresden, Ohio	—	1.25
Eau Claire, Wis.	4.25	.65@ 1.25
Estill Springs and Sewanee, Tenn.	1.35@ 1.50	1.35@ 1.50

(Continued on next page)

Wholesale Prices of Sand and Gravel

Prices given are per ton, F.O.B., producing plant or nearest shipping point

Washed Sand and Gravel

City or shipping point	Fine Sand, 1/10 in. down	Sand, ¼ in. and less	Gravel, ½ in. and less	Gravel, 1 in. and less	Gravel, 1½ in. and less	Gravel, 2 in and less
EASTERN:						
Ambridge & So. H'g'ts, Penn.	1.25	1.25	1.15	.85	.85	.85
Attica and Franklinville, N. Y.	.75	.75	.75	.75	.75	.75
Boston, Mass.	1.40	1.40	2.25	—	2.25	2.25
Buffalo, N. Y.	1.10	.95	—	—	.85	—
Erie, Pa.	—	1.00*	—	1.50*	1.75*	—
Farmingdale, N. J.	—	.48	.75	1.20	1.10	
Hartford, Conn.	.65*	—	—	—	—	—
Leeds Junction, Me.	—	.50	1.75	—	1.35	1.25
Machias Jct., N. Y.	—	.75	.75	—	.75	—
Montoursville, Penn.	1.00	1.00	1.00	.90	.90	.90
Northern New Jersey	.40@ .50	.40@ .50	1.25	1.25	1.25	—
Olean, N. Y.	—	.75	.75	—	.75	—
Portland, Me.	1.50	1.50	2.75	—	2.50	—
Shining Point, Penn.	—	—	1.00	1.00	1.00	1.00
Somerset, Penn.	—	1.85@2.00	—	—	—	—
South Heights, Penn.	1.25	1.25	.85	.85	.85	.85
Washington, D. C.	.85	.85	1.70	1.50	1.30	1.30
York, Penn.	1.10	1.00	—	—	—	—
CENTRAL:						
Algonquin and Beloit, Wis.	.50	.40	.60	.60	.60	.60
Appleton and Mankato, Minn.	—	.45	1.25	1.25	1.25	1.25
Attica, Ind.			All sizes .75@.85			
Aurora, Oregon, Sheridan, Moronts, Yorkville, Ill.	.60	.50	.40	.50	.60	.55
Barton, Wis.	—	.75	—	.75	.75	.85
Chicago district, Ill.	.70	.55	.55	.60	.60	.60
Des Moines, Iowa	—	.40	1.50	—	—	—
Eau Claire, Wis.	.65@1.25	.45	.80	.95	.95	—
Elgin, Ill.	—	.20*	.50*	1.50*	1.50*	1.50*
Elkhart Lake, Wis.	.50	.40	.50	.50	.40	.40
Ferrysburg, Mich.	—	.50@ .80	.60@1.00	.60@1.00	—	.50@1.25
Ft. Dodge, Iowa	.85	.85	2.05	2.05	2.05	2.05
Grand Haven, Mich.	—	.60@ .70	—	.70@ .90	—	.70@ .90
Grand Rapids, Mich.	—	.50	—	.80	.80	.70
Hamilton, Ohio	—	1.00	—	—	1.00	—
Hersey, Mich.	—	.50	—	—	—	.70
Humboldt, Iowa	.50	.50	1.50	1.50	1.50	1.50
Indianapolis, Ind.	.60	.60	—	.90	.75@1.00	.75@1.00
Joliet, Plainfield and Hammond, Ill.	.60	.50	.50	.60	.60	.60
Mason City, Iowa	.50	.50	1.45	1.45	1.35	1.35
Mankato, Minn.	—	.45	1.25	1.25	1.25	1.25
Mattoon, Ill.	.75	.75	.75	.75	.75	.75
Milwaukee, Wis.	—	1.01	1.21	1.21	1.21	1.21
Moline, Ill.	.60@ .85	.60@ .85	1.00@1.20	1.00@1.20	1.00@1.20	1.00@1.20
Northern New Jersey	.50	.50	1.50	1.25	1.25	—
Pittsburgh, Penn.	1.25	1.25	.85	.85	.85	.85
Silverwood, Ind.	.75	.75	.75	.75	.75	.75
St. Louis, Mo.	.83	1.45	1.55	1.45	1.45	1.45
Terre Haute, Ind.	.75	.60	.75	.75	.75	.75
Wolcottville, Ind.	.75	.75	.75	.75	.75	.75
Waukesha, Wis.	—	.45	.60	.60	.65	.65
Winona, Minn.	.40	.40	1.50	1.25	1.15	1.15
Zanesville, Ohio	—	.60	.50	.60	.80	—
SOUTHERN:						
Charleston, W. Va.		All sand, 1.40.	All gravel, 1.50.			
Brewster, Fla.	.60	.60	—	—	—	—
Chattahoochie River, Fla.	—	.70	—	1.75	—	—
Eustis, Fla.	—	.60@ .70	—	—	—	—
Ft. Worth, Texas	2.00	2.00	2.00	2.00	2.00	2.00
Knoxville, Tenn.	1.00	1.20	1.20	1.20	1.20	1.00
Lindsay, Texas	—	—	—	—	.55	—
Macon, Ga.	.50	.50	—	—	—	—
New Martinsville, W. Va.	1.00	.90@1.00	—	1.20@1.30	—	.80@ .90
Roseland, La.	.50	.50	2.25	1.25	1.10	1.10
WESTERN:						
Kansas City, Mo.	1.00	.70	—	—	—	—
Los Angeles, Calif.	.50	.50	1.10	1.10	—	1.10
Oregon City, Ore.	—	1.50*	1.50*	1.50*	1.50*	1.50*
Phoenix, Ariz.	1.25*	1.25*	2.25@2.50*	2.00*	1.75*	1.50*
Pueblo, Colo.	.80	.60	—	1.20	—	1.30
San Diego, Calif.	.65@ .75	.65@ .75	1.50	1.30	1.10	1.10
Seattle, Wash. (bunkers)	1.25*	1.25*	1.25*	1.25*	1.25*	1.25*

Bank Run Sand and Gravel

City or shipping point	Fine Sand, 1/10 in. down	Sand, ¼ in. and less	Gravel, ½ in. and less	Gravel, 1 in. and less	Gravel, 1½ in. and less	Gravel, 2 in. and less
Algonquin and Beloit, Wis.				Dust to 3 in., .40		
Chicago district, Ill.	.35	—	—	—	—	—
Ferrysburg, Mich.	—	—	—	—	—	.65@1.00
Gainesville, Texas	—	—	—	—	—	.55
Grand Haven, Mich.	—	—	—	—	—	.70@ .90
Grand Rapids, Mich.	—	—	—	.60	—	—
Hersey, Mich.	—	—	—	.50	—	—
Indianapolis, Ind.			Mixed gravel for concrete work, at .65			
Joliet, Plainfield and Hammond, Ill.	.35	1.25	—	—	—	—
Lindsay, Texas	—	—	—	—	—	.55
Macon, Ga.	.40	—	—	—	—	—
Moline, Ill. (b)	.60	.60	Concrete gravel, 50% G., 50% S., 1.00			
Ottawa, Oregon, Moronts and Yorkville, Ill.			Ave. .60 per ton all sizes			
Roseland, La.	—	—	—	—	—	.60
Somerset, Penn.	—	1.85@2.00	—	1.50@1.75	—	—
St. Louis, Mo.			Mine run gravel, 1.55 per ton			
Summit Grove, Ind.	.50	.50	.50	.50	.50	.54
Winona, Minn.	.60	.60	.60	.60	.60	.60
York, Penn.	1.10	1.00	—	—	—	—

(a) ⅝ in. down. (b) River run. (c) 2½ in. and less.
*Cubic yd. †Include freight and bunkerage charges and truck haul. ‡Delivered on job.
(1) Less 10c per ton if paid E.O.M. 10 days. (e) pit run. (f) plus 15c winter loading charge.

Core and Foundry Sands

Silica sand is quoted washed, dried and screened unless otherwise stated. Prices per ton f.o.b. producing plant.

City or shipping point	Molding, fine	Molding, coarse	Molding, brass	Core	Furnace lining	Sand blast	Stone sawing
Aetna, Ill.	....	....	....	.30@ .35	....	....	....
Albany, N. Y.	2.00	2.00	2.25	....	....	3.50	....
Arenzville, Ill.	1.50@1.75	....	....	1.00	....	....	....
Beach City, Ohio	1.75	1.75	....	1.75	2.00	....	....
Buffalo, N. Y.	1.50	1.50	....	2.00@2.50	....	....	....
Columbus, Ohio	1.25@2.00	1.25@1.75	2.00@2.50	.30@1.50	2.00@2.50	2.75@3.50	1.50@3.00
Dresden, Ohio	1.50@1.75	1.50	1.75	1.25	....	....	....
Eau Claire, Wis.	....	....	....	....	....	3.00	....
Elco, Ill.	Ground silica per ton in carloads—18.00@31.00						
Elnora, N. Y.	....	....	1.75	....	....	....	....
Estill Springs and Sewanee, Tenn.	1.25	....	....	1.25	....	1.35@1.50	....
Franklin, Penn.	1.75	1.75	2.00	1.75	....	....	....
Klondike, Mo.	1.75@2.00	....	1.75@2.00	1.75@2.00	1.75@2.00	....	....
Mapleton Depot, Pa.	2.00@2.25	2.00	2.25	2.00	2.00	2.00@2.25	....
Massillon, Ohio	2.50	....	....	2.50	2.50	....	....
Mendota, Va.	Ground flint or silex—16.00@20.00 per ton						
Michigan City, Ind.	....	....	....	.30	.30	....	....
Millville, N. J.	....	....	....	1.75b	....	3.50	....
Montoursville, Penn.	....	....	....	1.25@1.50	....	....	....
New Lexington, O.	2.00	1.50	....	....	....	....	....
Ohlton, Ohio	1.80b	1.80b	....	2.00b	1.80b	1.75b	....
Ottawa, Ill.	2.50	....	2.50	1.25	.75	3.50	3.50
Ridgeway, Penn.	1.50	1.50	....	....	....	....	....
Round Top, Md.	1.25	....	....	1.60	....	2.25	....
San Francisco, Calif.	3.50	4.75	3.50	3.50@5.00	3.50@4.50	3.50@5.00	....
Silica, Va.	....	....	....	10.00@16.00	....	....	....
Tamalco, Ill.	....	1.40@1.60	....	....	....	....	....
Thayers, Penn.	1.25	1.25	....	2.00	....	....	....
Utica, Ill.§	.40@1.00	.40@1.00	1.00	.40@1.00	.60@2.00	3.00@3.50	1.00@3.50
Utica, Ill.	.50	.60	1.00	.60	.65	3.00@3.50	1.00@3.50
Utica, Penn.	1.75	1.75	....	2.00	....	....	....
Zanesville, Ohio	2.00	1.50	2.00	2.00	2.00	....	....

*Green. †Crude silica, crushed and screened, not washed or dried. ‡Plus 75c per ton for winter loading. ¶Crude. §Crude and dry. (a) Delivered. (b) Damp.

Crushed Slag

City or shipping point	Roofing	¼ in. down	½ in. and less	¾ in. and less	1½ in and less	2½ in. and less	3 in. and larger
EASTERN:							
Buffalo, N. Y., Emporium and Dubois, Pa.	2.25	1.25	1.25	1.25	1.25	1.25	1.25
Eastern Penn.	2.50	1.20	1.50	1.20	1.20	1.20	1.20
Northern N. J.	2.50	1.20	1.50	1.20	1.20	1.20	1.20
Reading, Pa.	2.50	1.00	....	1.25	....	....	....
Western Penn.	2.50	1.25	1.50	1.25	1.25	1.25	1.25
CENTRAL:							
Ironton, Ohio	2.05*	1.45*	1.80*	1.45*	1.45*	1.45*	....
Jackson, Ohio	....	1.05*	....	1.30*	1.05*	1.30*	....
Toledo, Ohio	1.50	1.35	1.35	1.35	1.35	1.35	1.35
Youngst'n, O., dist.	2.00	1.25	1.35	1.35	1.25	1.25	1.25
SOUTHERN:							
Ashland, Ky.	....	1.55*	....	1.55*	1.55*	1.55*	....
Ensley and Alabama City, Ala.	2.05	.80	1.35	1.25	.90	.90	.80
Longdale, Roanoke, Ruessens, Va.	2.50	1.00	1.25	1.25	1.25	1.15	1.15
Woodward, Ala.	2.05*	.80*	1.35*	1.25*	.90*	.90*	....

*5c per ton discount on terms.

Lime Products (Carload Prices Per Ton F.O.B. Shipping Point)

	Finishing hydrate	Masons' hydrate	Agricultural hydrate	Chemical hydrate	Ground burnt lime, Blk.	Ground burnt lime, Bags	Lump lime, Blk.	Lump lime, Bbl.
EASTERN:								
Berkeley, R. I.	....	....	12.00	....	....	....	....	2.15e
Buffalo, N. Y.	....	12.00	12.00	12.00	....	....	10.00	1.95d
Chazy, N. Y.	12.50	10.50	8.00	12.00	11.50	16.50	10.00	2.50₂
Lime Ridge, Penn.	....	....	....	....	5.00a	....	....	....
West Stockbridge, Mass.	12.00	10.00	5.60	....	....	....	....	2.00t
Williamsport, Penn.	....	....	10.00	....	....	....	6.00	....
York, Penn.	....	9.50	9.50	10.50	8.50	10.50	8.50	1.65i
CENTRAL:								
Afton, Mich.	....	....	....	....	....	....	8.50	1.35
Carey, Ohio	8.50	8.00	....	....	9.00	....	8.50	1.50
Cold Springs, Ohio	12.50	8.50	8.50	....	9.00	....	8.00	....
Delaware, Ohio	....	8.50	8.50	10.00	....	....	8.50	1.50
Frederick, Md.	....	10.00	10.00	10.00	8.50	10.00	7.00	....
Gibsonburg, Ohio	12.50	8.50	8.50	....	9.00	11.00	8.00	....
Huntington, Ind.	12.50	8.50	8.50	....	9.00	....	8.00	....
Luckey, Ohio	12.50	....	....	....	....	....	....	....
Marblehead, Ohio	....	8.50	8.50	....	9.00	....	8.00	1.50w
Marion, Ohio	....	8.50	.850	....	....	....	8.00	1.70d
Milltown, Ind.	....	9.00@10.00	....	10.00p	....	....	8.50q	1.40r
Sheboygan, Wis.	11.50	....	....	....	....	....	9.50	.95
Tiffin, Ohio	....	....	....	....	9.00	....	....	....
White Rock, Ohio	12.50	....	....	....	9.00	11.00	8.00	....
Wisconsin points (f)	....	11.50	....	....	....	....	9.50	....
Woodville, Ohio	12.50	8.50	8.50	13.50	9.00	10.50	9.00	1.50
SOUTHERN:								
Allgood, Ala.	12.50	10.00	....	....	8.50	....	8.50	1.50
El Paso, Tex.	22.50	....	....	....	....	....	8.00	....
Graystone, Ala.	12.50	10.00	....	12.50	....	....	8.50	1.50
Keystone, Ala.	....	10.00	10.00	10.00	8.50	1.45u	8.50	1.50
Knoxville, Tenn.	20.50	10.00	9.00	10.00	8.50	1.35	8.00	1.50
Longview, Ala.	12.50	10.00	9.00	10.00	....	....	8.50	1.50
New Braunfels, Tex.	18.00	12.00	10.00	12.00	10.00	....	9.50	....
Ocala, Fla.	14.00	13.00	12.00	13.00	....	....	12.00	1.70
Saginaw, Ala.	12.50	10.00	9.00	10.00	....	....	8.50	1.50
WESTERN:								
Kirtland, N. M.	....	....	....	....	....	....	15.00	....
Limestone, Wash.	15.00	15.00	10.00	15.00	16.50	16.50	16.50	2.09
Dittlinger, Tex.	....	12.00@13.00	....	....	....	....	9.50₅	1.50₄
San Francisco, Calif.	21.00	19.00	16.50	....	....	....	14.00	2.00
Tehachapi, Calif.	....	....	8.00	....	....	....	13.00z	2.20x
Seattle, Wash.	19.00	19.00	12.00	19.00	19.00	....	18.60	2.30

†50-lb. paper bags; (a) run of kilns; (c) wooden, steel 1.70; (d) steel; (e) per 180-lb. barrel; (f) dealers' prices, net 30 days less 25c disc. per ton on hydrated lime and 5c per bbl. on lump if paid in 10 days; (i) 180-lb. net barrel, 1.65; 280-lb. net barrel, 2.65; (p) to 11.00; (q) to 8.75; (r) to 1.50; (s) in 80-lb. burlap sacks; (t) to 3.00; (u) two 90-lb. bags; (v) oil burnt; wood burnt 2.25@2.50; (x) wood, steel 2.30; (z) to 15.00; (*) quoted f.o.b. New York; (‡) paper bags; (w) to 1.50 in two 90-lb. bags, wood bbl. 1.60; (¶) to 10.00; (₁) 80-lb. paper bags; (₂) to 3.00; (₃) to 9.00; (₄) to 1.60. (₅) to 16.00; (₆) wood bbl., steel, 1.80.

Miscellaneous Sands

(Continued)

City or shipping point	Roofing sand	Traction
Gray Summit and Klondike, Mo.	2.00	....
Mapleton Depot, Penn.	2.00	2.00@ 2.25
Massillon, Ohio	....	2.25
Michigan City, Ind. (Engine sand)	....	.15@ .25
Mineral Ridge, Ohio	*1.75@ 2.00	*1.75
Montoursville, Penn.	....	1.25
Ohlton, Ohio	1.80	1.80
Ottawa, Ill.	1.25	....
Red Wing, Minn.	....	1.25
Round Top, Md.	2.25	1.75
San Francisco, Calif.	3.50@ 4.50	3.50@ 4.50
Thayers, Penn.	....	2.25
Utica, Ill.	1.00@ 3.50	.90
Warwick, Ohio	....	2.25
Zanesville, Ohio	....	2.50

*Wet.

Talc

Prices given are per ton f.o.b. (in carload lots only), producing plant, or nearest shipping point,

Baltimore, Md.:	
Crude talc (mine run)	3.00@ 4.00
Ground talc (20-50 mesh), bags	10.00
Cubes	55.00
Blanks (per lb.)	.08
Pencils and steel worker's crayons	.08
per gross	1.00@ 1.50
Chatsworth, Ga.:	
Crude Talc	5.00
Ground (150-200 mesh), bulk	10.00
Pencils and steel worker's crayons, per gross	1.50@ 2.00
Chester, Vt.:	
Ground talc (150-200 mesh), bulk	9.00@10.00
Including bags	10.00@11.00
Chicago and Joliet, Ill.:	
Ground (150-200 mesh), bags	30.00
Dalton, Ga.:	
Crude talc	5.00
Ground talc (150-200) bags	10.00@12.00
Pencils and steel workers' crayons, per gross	1.00@ 1.50
Emeryville, N. Y.:	
(Double air floated) including bags; 325 mesh	14.75
200 mesh	13.75
Hailesboro, N. Y.:	
Ground white talc (double and triple air floated) including bags, 300-350 mesh	15.50@20.00
Henry, Va.:	
Crude (mine run)	3.50@ 4.50
Ground talc (150-200 mesh), bulk	9.00@14.50
Joliet, Ill.:	
Roofing talc, bags	12.00
Ground talc (200 mesh), bags	30.00
Keeler, Calif.:	
Ground (200-300 mesh), bags	20.00@30.00
Natural Bridge, N. Y.:	
Ground talc (125-200 mesh), bags	10.00@15.00

Rock Phosphate

Prices given are per ton (2240-lb.) f.o.b. producing plant or nearest shipping point.

Lump Rock

Gordonsburg, Tenn.—B.P.L. 65-70%	4.00@ 5.00
Mt. Pleasant, Tenn.—B.P.L. 72%	5.00@ 5.50
Tennessee—F.O.B. mines, gross ton, unground brown rock, B.P.L. 72%	5.00
B.P.L. 75%	6.00
Twomey, Tenn.—B.P.L. 65%, 2000 lb.	8.00@ 9.00

Ground Rock

(2000 lbs.)

Centerville, Tenn.—B.P.L. 65%	7.00
Gordonsburg, Tenn.—B.P.L. 68-72%	4.00@ 5.00
Mt. Pleasant, Tenn.—B.P.L. 65%	8.00
Twomey, Tenn.—B.P.L. 65%	8.00@ 9.00

Florida Phosphate

(Raw Land Pebble)

(Per Ton.)

Florida—F. O. B. mines, gross ton, 68/66% B.P.L., Basis 68%	3.25
70% min. B.P.L., Basis 70%	3.75

Mica

Prices given are net, F.O.B. plant or nearest shipping point.

Franklin, N. C.—Mine run, per lb.	.05@.10
Mine scrap, per ton	20.00
Clean shop scrap, per ton	22.00
Punch mica, per lb.	.05@.10
Pringle, S. D.—Mine run, per ton	125.00
Punch mica, per lb.	.06
Scrap, per ton, carloads	20.00
Rumney Depot, N. H. — per ton, Mine run	360.00
Clean shop scrap	25.00
Mine scrap	22.00
20 mesh	35.00
60 mesh	45.00
100 mesh	60.00
200 mesh	65.00
Punch, mica, per lb.	.11

Special Aggregates

Prices are per ton f.o.b. quarry or nearest shipping point.

City or shipping point	Terrazzo	Stucco-chips
Barton, Wis., f.o.b. cars	....	10.50
Brandon, Vt.—English pink, English cream and coral pink	*11.00	*11.00
Brandon grey	*11.00	*11.00
Brighton, Tenn.—Pink	6.00	5.00
Mixed pink and bronze	4.50@ 6.00	4.50@ 6.00
All colors, mixed sizes	3.50	3.50
Buckingham, Que.—Buff stucco dash	....	12.00@14.00
Chicago, Ill. — Stucco chips, in sacks f.o.b. quarries	....	17.50
Crown Point, N. Y.—Mica Spar	....	8.00@10.00
Dayton, Ohio	....	6.00@24.00
Easton, Penn., and Phillipsburg, N. J.	12.00@16.00	12.00@16.00
Haddam, Conn. — Felstone buff	15.00	15.00
Harrisonburg, Va.—Bulk marble (crushed, in bags)	†12.50	†12.50
Ingomar, Ohio — Concrete facings and stucco dash	....	6.00@20.00
Middlebrook, Mo.—Red	....	25.00@30.00
Middlebury, Vt.—Middlebury white	‡9.00	‡9.00
Middlebury and Brandon, Vt.—Caststone, per ton, including bags	....	5.50
Milwaukee, Wis.	....	14.00@34.00
Newark, N. J.—Roofing granules	....	7.50
New York, N. Y.—Red and yellow Verona	....	32.00
Red Granite, Wis.	....	7.50
Stockton, Calif. — "Natrock" roofing grits	....	12.00@15.00
Tuckahoe, N. Y.—Tuckahoe white	12.00	12.00
Wauwatosa, Wis.	....	20.00@32.00
Wellsville, Colo.—Colorado Travertine Stone	15.00	15.00

†C.L. L.C.L. 17.00.
*C.L. including bags; L.C.L. 14.50
‡C.L. including bags, L.C.L. 10.00.

Potash Feldspar

Auburn and Brunswick, Me.—Color, white; 98% thru 140 mesh bulk	19.00
Buckingham, Que.—Color, white; analysis, K_2O, 12-13%; Na_2O, 1.75%; bulk	9.00
De Kalb Jct., N. Y.—Color, white; bulk (crude)	9.00
East Hartford, Conn.—Color, white, 95% through 60 mesh, bags	16.00
96% thru 150 mesh, bags	23.00
East Liverpool, Ohio—Color, white; 98% thru 200 mesh, bulk	19.35
Soda feldspar, crude, bulk, per ton	22.00
Erwin, Tenn.—Color, white; analysis, 12.07% K_2O, 19.34% Al_2O_3; Na_2O, 2.92%; SiO_2, 64.76%; Fe_2O_3, .36%; 98.50% thru 200 mesh, bags, 16.90; bulk	15.50
Glen Tay Station, Ont., color, red or pink; analysis: K_2O, 12.81%, crude (bulk)	7.00
Keystone, S. D.—Prime white, bulk (crude)	8.00
Los Angeles, Calif.—Color, white; analysis, K_2O, 13.78%; Na_2O, 3.68%; SiO_2, 62.97%; Fe_2O_3, .23%; Al_2O_3, 19.20%; crude, bags, 13.50; bulk	12.50
Pulverized, 96% thru 200 mesh, bags, 23.50; bulk	22.20
Murphysboro, Ill.—Color, prime white; analysis, K_2O, 12.60%; Na_2O, 2.35%; SiO_2, 63%; Fe_2O_3, .06%; Al_2O_3, 18.20%; 98% thru 200 mesh; bags, 21.00; bulk	20.00
Penland, N. C.—Color, white; crude, bulk	8.00
Ground, bulk	16.50
Spruce Point, N. C., and Bristol, Tenn.—Color, white; 90% thru 200 mesh, bulk	12.50@20.00
Tenn. Mills—Color, white; analysis K_2O, 18%; Na_2O, 10%; 68% SiO_2; 99% thru 200 mesh; bulk	18.00
99% thru 140 mesh, bulk	16.00
Topsham, Me.—98% thru 140 mesh, bulk	19.00
Toronto, Can.—Color, flesh; analysis K_2O, 12.75%; Na_2O, 1.96%; crude	7.50@ 8.00
Trenton, N. J.—Crude, bulk	12.00@27.00
99% thru 140 mesh; bulk	16.00

(Bags 11 cents each, non-returnable)

Blended Feldspar
(Pulverized)

Tenn. Mills—Bulk	16.00@20.00

Chicken Grits

Afton Mich. (limestone) per ton	10.00
Belfast and Rockland, Me.—(Limestone), bags, per ton	‡10.00
Brandon and Middlebury, Vt., per ton	10.00
Centerville, Iowa (gypsum) per ton	18.00
Chico, Texas (limestone), 100 lb. bags, per ton	8.00@ 9.00
Danbury, Conn. (limestone)	7.00@ 9.00
Easton, Penn.—Per ton, bulk	3.00
Knoxville, Tenn.—per bag	1.00
Los Angeles Harbor (limestone), 100-lb sack, 1.00; sacks, per ton, 8.50@9.50†; bulk, per ton	6.00@7.00†
Gypsum, Ohio.—(Gypsum) per ton	10.00
Limestone, Wash. (limestone) per ton	12.50
Rocky Point, Va. (limestone) 100 lb. bags, 50c; sacks, per ton, 6.00 bulk	5.00
Seattle, Wash.—(Limestone), bulk, per ton	12.50
Warren, N. H.—(Mica) per ton	7.70@7.90‡
Waukesha, Wis.—(Limestone), per ton	8.00
West Stockbridge, Mass.—(Limestone) bulk	7.50@9.00*

*L.C.L.
†Less than 5-ton lots.
‡C.L.

Sand-Lime Brick

Prices given per 1000 brick f.o.b. plant or nearest shipping point, unless otherwise noted.

Barton, Wis.	10.50
Boston, Mass.	*17.00
Brighton, N. Y.	*19.75
Dayton, Ohio	12.00@13.50
Detroit, Mich.	¶15.00
Farmington, Conn.	13.00
Flint, Mich.	¶12.50@16.00
Grand Rapids, Mich.	12.00
Hartford, Conn.	*19.00
Jackson, Mich.	13.00
Lancaster, N. Y.	12.50
Madison, Wis.	a12.50
Michigan City, Ind.	11.00
Milwaukee, Wis.	*13.00
Minneapolis and St. Paul, Minn.	11.25
Minnesota Transfer	10.00
New Brighton, Minn.	10.00
Pontiac, Mich.	13.50@17.00
Portage, Wis.	15.00
Prairie du Chien, Wis.	18.00@22.50
Rochester, N. Y.	*19.75
Saginaw, Mich.	13.00
San Antonio, Texas	16.00
Sebewaing, Mich.	12.00
Syracuse, N. Y.	16.00@20.00*
Toronto, Canada	15.60†
Toronto, Canada	13.10
Wilkinson, Fla.	10.00@12.00

*Delivered on job. †Sales tax included.
‡Less 5%. ¶Dealers' price. (a) Less .50 E.O.M. 10 days.

Portland Cement

Prices per bag and per bbl, without bags net in carload lots.

	Per Bag	Per Bbl.
Albuquerque, N. M.	....	3.47
Atlanta, Ga.	....	2.35
Baltimore, Md.	....	2.25
Birmingham, Ala.	....	2.30
Boston, Mass.	....	2.53
Buffalo, N. Y.	....	2.38
Butte, Mont.	.90¼	3.61
Cedar Rapids, Iowa	....	2.34‡
Charleston, S. C.	....	2.35
Cheyenne, Wyo.	.82¾	3.31
Cincinnati, Ohio	56¾	2.37‡
Cleveland, Ohio	....	2.29‡
Chicago, Ill.	....	2.10‡
Columbus, Ohio	....	2.34
Dallas, Texas	....	2.10
Davenport, Iowa	....	2.29‡
Dayton, Ohio	....	2.38
Denver, Colo.	.66¼	2.65
Detroit, Mich.	....	1.95@2.15‡
Duluth, Minn.	....	2.09‡
Houston, Texas	....	2.60
Indianapolis, Ind.	....	2.29‡
Jackson, Miss.	....	2.60
Jacksonville, Fla.	....	2.20
Jersey City, N. J.	....	2.23
Kansas City, Mo.	....	1.92
Los Angeles, Calif.	.59½	2.44†
Louisville, Ky.	.54⅛	....
Memphis, Tenn.	....	2.60
Milwaukee, Wis.	....	2.25‡
Minneapolis, Minn.	....	2.32‡
Montreal, Que.	....	1.36
New Orleans, La.	....	2.20
New York, N. Y.	....	2.15
Norfolk, Va.	....	2.17
Oklahoma City, Okla.	....	2.46
Omaha, Neb.	....	2.36
Peoria, Ill.	....	2.27‡
Philadelphia, Penn.	....	2.31
Phoenix, Ariz.	....	2.91
Pittsburgh, Penn.	....	2.09‡
Portland, Colo.	....	2.80
Portland, Ore.	....	2.70
Reno, Nevada	....	2.91
Richmond, Va.	....	2.44
Salt Lake City, Utah	.70¼	2.81
San Francisco, Calif.	....	2.21
Savannah, Ga.	....	2.50
St. Louis, Mo.	.55	2.20
St. Paul, Minn.	....	2.32‡
Seattle, Wash.	10c discount	2.65
Tampa, Fla.	....	2.25
Toledo, Ohio	....	2.20‡
Topeka, Kans.	....	2.41
Tulsa, Okla.	....	2.33
Wheeling, W. Va.	....	2.17
Winston-Salem, N. C.	....	2.78

NOTE—Add 40c per bbl. for bags.
†Delivered on job in any quantity, sacks extra
‡Ten cents discount for cash, 15 days.

Mill prices f.o.b. in carload lots, without bags to contractors.

	Per Bag	Per Bbl.
Buffington, Ind.	....	1.85
Chattanooga, Tenn.	....	2.45*
Concrete, Wash.	....	2.35
Davenport, Calif.	....	2.05
Detroit, Mich.	....	2.15
Hannibal, Mo.	....	1.85
Hudson, N. Y.	....	1.95
Leeds, Ala.	....	1.95
Mildred, Kans.	....	2.35
Nazareth, Penn.	....	1.95
Northampton, Penn.	....	1.85
Richard City, Tenn.	....	2.05
Steelton, Minn.	....	1.90
Toledo, Ohio	....	2.20
Universal, Penn.	....	1.85

*Including sacks at 10c each.

Gypsum Products—CARLOAD PRICES PER TON AND PER M SQUARE FEET, F. O. B. MILL

	Crushed Rock	Ground Gypsum	Agri-cultural Gypsum	Stucco Calcined Gypsum	Cement and Gauging Plaster	Wood Fiber	White Gauging	Sanded Plaster	Keene's Cement	Trowel Finish	—Plaster Board— ¼x32x 36". Wt. 1500 lb. Per M Sq. Ft.	⅜x32x 36". Wt. 1850 lb. Per M Sq. Ft.	Wallboard, ⅜x32 or 48". Lgths. 6'-10', 1850 lb. Per M Sq. Ft.
Arden, Nev. and Los Angeles, Calif.	3.00	8.00u	8.00u	10.70u	10.70u	....	....	....	....	11.70u	....	....	....
Centerville, Iowa	3.00	10.00	15.00	10.00	10.00	10.50	13.50	....	....	13.50	....	....	....
Des Moines, Ia.	3.00	8.00	9.00	10.00	10.00	10.50	13.50	12.00	24.00	22.00	18.00	21.00	30.00
Detroit, Mich.	....	....	....	....	....	....	....	m9.00@11.00o	....	....	....	....	....
Delawanna, N. J.	—	—	—	—	—	8.00	....	8.25@9.40	....	....	.14½s	.15½s	40.00@41.00
Douglas, Ariz.	....	....	7.00	....	....	15.50d	18.50	....	30.00	15.50	....	....	....
Grand Rapids, Mich.	2.75	6.00	6.00	8.00	9.00	9.00	17.50	....	24.55	20.00	....	....	....
Gypsum, Ohio‡	3.00	4.00	6.00	8.00	9.00	9.00	19.00	7.00	27.00	20.00	....	15.00	30.00
Los Angeles, Calif.	....	....	....	8.50	....	....	....	....	....	....	....	....	....
Port Clinton, Ohio	3.00	4.00	6.00	10.00	9.00	9.00	21.00	7.00	30.15	20.00	....	20.00	30.00
Portland, Colo.	....	....	....	10.00		....	....	....	....	....	....	....	....
San Francisco, Cal.	....	....	14.00	14.40	15.40	....	15.40	....	....	....	....	....	....
Seattle, Wash.	6.60	11.00	11.00	15.00	....	16.00	....	....	....	....	....	....	....
Sigurd, Utah	....	....	....	....	....	....	....	....	21.50	....	....	....	....
Winnipeg, Man.	5.00	5.00	7.00	13.00	14.00	14.00	....	....	....	....	20.00	25.00	33.00

NOTE—Returnable bags, 10c each; paper bags, 1.00 per ton extra (not returnable).
*To 3.00; †to 11.00; ‖to 12.00; ‡prices per net ton, sacks extra; (a) to 25.00; (b) net; (c) gross; (d) hair fibre; (i) delivered; (h) delivered in six states: (i) delivered on job; (k) sacks 12c extra, rebated; (m) includes paper bags; (o) includes jute sacks; (r) including sacks at 15c; (s) per board; (t) to 16.50; (u) includes sacks; (v) F.O B. N. Y. C. and dealers yard in mill locality.

Market Prices of Cement Products

Concrete Block

Prices given are net per unit, f.o.b. plant or nearest shipping point

City of shipping point	Sizes 8x8x16	8x10x16	8x12x16
Camden, N. J.	17.00	....	....
Cement City, Mich.		5x8x12—55.00¶	
Columbus, Ohio	.16@.18a	....	....
Detroit, Mich.	.16	....	.18
Forest Park, Ill.	18.00*	23.00*	30.00*
Grand Rapids, Mich.	.15	....	....
Graettinger, Iowa	.18@.20	....	....
Indianapolis, Ind.	.13@.15†	....	....
Los Angeles, Calif.¶	5¾x3½x12—55.00	7¾x3½x12—65.00	
Oak Park, Ill.	.18@.21a	....	....
Olivia and Mankato, Minn.	9.50b	....	....
Somerset, Penn.	.18@.22	....	....
Tiskilwa, Ill.	.16@.18†	....	....
Yakima, Wash.	20.00*	....	....

*Price per 100 at plant. †Rock or panel face. (a) Face. ‡Delivered. ¶Price per 1000. (b) Per ton.

Cement Roofing Tile

Prices are net per sq. in carload lots, f.o.b. nearest shipping point unless otherwise stated.

Camden and Trenton, N. J.—8x12, per sq.

Red	15.00
Green	18.00

Chicago, Ill.—per sq. 20.00

Cicero, Ill.—Hawthorne roofing tile, per sq.

	Chocolate, Red and Orange	Green Blue
French and Spanish†	$11.50	$13.50
Ridges (each)	.25	.35
Hips	.25	.35
Hip starters	.50	.60
Hip terminals, 2-way	1.25	1.50
Hip terminals, 4-way	4.00	5.00
Mansard terminals	2.50	3.00
Gable finials	1.25	1.50
Gable starters	.25	.35
Gable finishers	.25	.35
*End bands	.25	.35
*Eave closers	.06	.08
*Ridge closers	.05	.06

*Used only with Spanish tile.
†Price per square.

Houston, Texas.—Roofing Tile, per sq. 25.00

Indianapolis, Ind.—9x15-in. Per sq.

Gray	10.00
Red	11.00
Green	13.00

Waco, Texas: Per sq.

4x4	.60

Cement Building Tile

Cement City, Mich	Per 1000
5x8x12	55.00
Detroit, Mich.	Per 100
5x4x12	4.50
5x8x12	8.00
Longview, Wash.	Per 1000
4x6x12	52.00
4x8x12	64.00
Mt. Pleasant, N. Y.:	Per 1000
5x8x12	78.00
Grand Rapids, Mich.:	Per 1000
5x8x12	70.00
Houston, Texas:	
5x8x12 (Lightweight)	80.00
Pasadena, Calif. (Stone-Tile)	Per 100
3½x4x12	3.00
3½x6x12	4.50
3½x8x12	6.00
Tiskilwa, Ill.—8x8, per 100	15.00
Wildasin Spur, Los Angeles, Calif.	(Stone-Tile) Per 1000
3½x6x12	50.00
3½x8x12	60.00
Prairie du Chien, Wis.	14.00 22.50@27.00
Yakima, Wash.—Building tile:	
5x8x12	.10

Cement Drain Tile

Graettinger, Iowa—5 to 36 in., per ton	8.00
Olivia and Mankato, Minn.—Cement drain tile, per ton	8.00
Tacoma, Wash.—Drain tile per ft.:	
3 in.	.04
4 in.	.05
6 in.	.07½
8 in.	.10
Waukesha, Wis.—Drain tile, per ton	9.00

Concrete Brick

Prices given per 1000 brick, f.o.b. plant or nearest shipping point.

	Common	Face
Appleton, Minn.	22.00	30.00@35.00
Baltimore, Md. (Del. according to quantity)	15.50	22.00@50.00
Camden and Trenton, N. J.	17.00	
Ensley, Ala. ("Slag-tex")	14.50	22.50@33.50
Eugene, Ore.	25.00	35.00@75.00
Friesland, Wis.	22.00	32.00
Longview, Wash.	18.00	25.00@75.00
Milwaukee, Wis.	15.00	25.00@75.00
Mt. Pleasant, N. Y.		14.00@23.00
Omaha, Neb.	18.00	30.00@40.00
Pasadena, Calif.	11.00	....
Philadelphia, Penn.	15.00	20.00
Portland, Ore.	17.00	25.00@75.00
Prairie du Chien, Wis.	14.00	23.00@27.00
Rapid City, S. D.	18.00	25.00@80.00
Waco, Texas	16.50	32.50@125.00
Watertown, N. Y.	20.00	35.00
Wauwatosa, Wis.	14.00	21.00@42.00
Westmoreland Wharves, Penn.	15.00	20.00
Winnipeg, Man.	14.00	22.00
Yakima, Wash.	22.50	....

†Gray. ‡Red.

Shearman Company to Build Plant at Miami

THE Shearman Concrete Pipe Co., Inc., of Knoxville, Tenn., will establish a plant in Miami immediately for the manufacture of its products, it was announced recently by Fred L. Conner, president of the company.

A temporary site has been leased from the Harrison Construction Co. on the Hialeah branch of the F. E. C. near N. W. Second avenue, according to George B. Newbold, vice president and general manager of the company. The plant project, exclusive of the ground site, will involve about $100,000, it is said, and may later be enlarged.

The Shearman company, with main offices in Knoxville, is one of the largest reinforced concrete pipe manufacturers in the country, and has branches in several principal cities, including Jacksonville, Tampa, Sarasota, Bartow, Manatee and Lake Worth. Recently the company sold its plants at Little Rock, Ark., and Dallas, Texas, to a company headed by R. W. Lander, as announced in the May 1 issue of ROCK PRODUCTS. The Miami location is the result of several months' investigation as to market possibilities, the company officials state.

Two carloads of machinery and equipment are now on the way. The company will employ 35 men regularly.—*Miami (Fla.) Herald.*

Concrete School Proves Popular

THE concrete school conducted under the auspices of the Builders Exchange in San Antonio, Tex., has proven one of the most popular events of this kind ever held in this city. Nearly 200 contractors, engineers, architects and others allied with the building industries have registered for the short course and a keen interest is being manifested in all that is taking place. The course is being given by the Portland Cement Association, assisted by the Builders Exchange and the San Antonio chapter of Associated General Contractors. A. A. Anderson, construction engineer of the Materials Research Laboratory of Chicago, Don Lee of the Dallas district office and F. L. Bramlette of San Antonio, are the three representatives of the association in charge of the school.

Current Prices Cement Pipe

Prices are net per foot f.o.b. cities or nearest shipping point in carload lots unless otherwise noted.

Culvert and Sewer	4 in.	6 in.	8 in.	10 in.	12 in.	15 in.	18 in.	20 in.	22 in.	24 in.	27 in.	30 in.	36 in.	42 in.	48 in.	54 in.	60 in.
Detroit, Mich.								15.00 per ton									
Graettinger, Iowa	.04½d	.05½	.08½	.12½	.17½	......	.40	.50	.60	.70	......	......	......	......	......	......	—
G'd Rapids, Mich. (b)	......	......	......	.60	.72	1.00	1.28	......	......	1.92	2.32	3.00	4.00	5.00	6.00	......	—
Houston, Texas	......	.19	.28	.43	.55½	.90	1.30	......	†1.70	2.20	......	......	......	......	......	......	—
Indianapolis, Ind. (a)	......	......	......	.80	.90	1.10	1.30	......	......	1.70	......	2.70	......	......	......	......	—
Longview, Wash.							Sewer pipe 40% off list, culvert—list										
Mankato, Minn. (b)	......	......	......	......	......	......	......	......	......	1.50	1.75	2.50	3.25	4.25	......	......	—
Newark, N. J.						6 in. to 24 in., $18.00 per ton											
Norfolk, Neb.	......	......	......	......	.90	1.00	1.13	1.42	......	......	2.11	......	2.75	3.58	......	6.14	7.78
Olivia, Mankato, Minn.							12.00 per ton										
Paullina, Iowa‡	......	......	......	......	......	......	......	2.25	......	2.11	......	2.75	3.58	......	6.14	......	7.78
Somerset, Penn.	......	......	......	......	1.08	1.25	1.65	......	......	2.50	......	3.65	4.85	7.50	8.50	......	—
Tacoma, Wash.	.15	.18	.22	.30	.40	.60	.75	......	......	......	......	......	......	......	......	......	—
Tiskilwa, Ill. (rein.) (a)	......	......	......	.65	.75	.85	1.10	1.60	......	1.90	......	2.25	3.40	......	5.50	......	7.78
Wahoo, Neb. (b)	......	......	......	......	1.00	1.13	1.42	......	......	2.11	......	2.75	3.58	4.62	6.14	6.96	7.78
Waukesha, Wis.							12 in. to 60 in. 18.00 per ton										
Yakima, Wash.								$10.00 per ton									

*30-in. lengths up to 27-in. diam., 48-in. lengths after; (a) 24-in. lengths; (b) Reinforced; (c) Interlocking bar reinforced.
†21-in. diam. ‡Price per 2 ft. length. (d) 5 in. diam. [1]@1.08 [2]@1.25. [3]@1.65. [4]@2.50. [5]@3.85. [6]@5.00. [7]@7.50.

Norfolk Company to Build Rehandling Plant

THE Norfolk Sand and Gravel Corp., Norfolk, Va., has just acquired a large waterfront tract of land at Hopewell, Va., and will erect a 500-ft. dock with a modern rehandling plant for sand and gravel at a cost of approximately $100,000, it was announced recently by G. M. Umdetler, general manager of the company.

The purpose of this plant is for reloading of sand and gravel from scows into cars for rail shipments south and west and for quick loading of steamers for the South Atlantic trade, and smaller vessels for water shipments to points in Virginia and North Carolina.

The dock, Mr. Umdetler advised, will contain two standard gage tracks of 20-car capacity, behind which will be storage space for 25,000 tons of sand and gravel. The whole plant will be operated electrically.

The deposits of sand and gravel owned by the Norfolk Sand and Gravel Corp. are located about 12 miles up the James river from Hopewell, from whence these materials will be loaded on open-deck lighters and towed to Hopewell.

The rail connection from there will be via the Norfolk and Western railroad.

Contract has been let to the Sanford and Brooks Co. for the construction of the wharf and the Norfolk Dredging Co. for the dredging necessary to give the wharf sufficient depth to accommodate deepest draft vessels which the James river will permit.

All business at this point will be handled through the company's main office at Norfolk.

Gypsum Company's Steamer Saves Crew from Sinking Freighter

SURVIVORS of the British sailing ship *William Melbourne*, lost Wednesday, October 27, in a gale in the Bay of Fundy, were landed at New Brighton, New York, on Saturday, October 30, from the steamer *Felix* of the United States Gypsum Transportation Co., which was forced to abandon the ship after several hours of heroic effort to take the foundering ship into port.

The *Felix*, under the command of Capt. Andrew Lindan, sailed from Windsor, Nova Scotia, 3 a. m., Tuesday, October 26, with a cargo of gypsum rock for the New Brighton mill of the United States Gypsum Co. At 8 a. m., off Isle Haute, the vessel ran into a strong westerly gale, and at 10 a. m. Chief Officer Haagenbik sighted the *William Melbourne* with masts and rigging down, foundering in the wind and waves.

Captain Lindan headed his steamer toward the disabled vessel and took up a position to the southwest of it. A boat was lowered from the lee side of the *Felix*, but was so badly damaged by the heavy seas that it was impossible to row it from the side of the vessel. Captain Lindan then turned the *Felix* about, a boat was lowered from the starboard side and Second Mate Knud Evernberg called for volunteers to rescue the crew of the schooner.

After the lifeboat had pulled through the storm to the side of the schooner, Capt. Zenas H. Richards of the *Melbourne*, mindful of saving his ship, asked that a towline he placed aboard. At the time both the *Felix* and the *Melbourne* stood only two miles off Isle Haute, and the operation of getting a line aboard the *Melbourne* placed both vessels in jeopardy because of the west wind that was driving them toward the rocky coast.

However, the line finally was made fast and the *Felix* steamed westward and north until the line parted and again set the *Melbourne* adrift. In the driving wind four more efforts were made to place another towline aboard, but, with the schooner foundering, without masts or rigging, and the crews of both vessels in danger of losing their lives, Captain Lindan decided to take refuge until morning in the shelter of Spencer Island.

Search on the following morning failed to reveal a trace of the schooner, and Captain Lindan steamed for New Brighton, where he landed the survivors and reported the incident to officials of the United States Gypsum Transportation Co.—*New York Commercial.*

Plaster Board Orders Sent to Chile and China

A LARGE shipment of plaster wall board has just been sent to Antofogasta, Chile, by the Schumacher Wall Board Corp. of Los Angeles, according to the Los Angeles (Calif.) *Times*. Another carload of the same material is reported to have been shipped recently by the Schumacher corporation to Shanghai, China.

Shipments of plaster wall board have been increasing since a trial order was sent to the country several months ago, according to Earl Schmidt, sales manager for the corporation, and the order to Shanghai also follows the shipment of a trial consignment to a dealer in that city.

Concrete Curbing Wins in Detroit

A SUCCESSFUL fight was recently waged against the passage of an amendment in the city of Detroit which if passed would make it compulsory to use stone for curbing. The amendment aimed at the use of concrete curbing, which is reported to be on the increase and, because of its decidedly lower cost, seriously cutting into the cut stone curbing business. Personal cards mailed to customers by the United Fuel and Supply Co., and other cement products manufacturers of Detroit, acquainted them with the true status of the bill and helped to defeat the amendment.

Georgia Company to Build Sand Plant

WE are officially informed that the Central of Georgia Sand Co., Howard, Ga., is contemplating the immediate erection of a modern sand washing plant and would be pleased to get in touch with any machinery manufacturers to supply them with the necessary equipment. All inquiries should be addressed to Poole Maynard, industrial geologist, Atlanta, Birmingham and Atlantic Railway Co., Atlanta, Ga.

Canadian Feldspar Production

REVISED statistics issued by the Dominion Bureau of Statistics at Ottawa show that the production of feldspar in Canada declined in 1925 to 28,681 tons, valued at $235,789, a falling off of 16,123 tons and $122,751 from the high level of 44,804 tons at $358,540, established in 1924. The total capital invested by the 23 firms operating in this industry during 1925 amounted to $712,329. Employment statistics showed 11 salaried employes and 229 wage earners on the payroll during the year. Their earnings totaled $165,766.

British Quarrying Industry Fights Government Competition

THE following letter to the editor of *The Contract Journal* (England) is interesting in showing that British as well as American quarry owners are faced with the competition of local government competition. The letter follows:

SIR—It is refreshing to come in contact with an industry, akin to mining, too, in which there has been no serious dispute for 20 years and whose Joint Industrial Council is a model of good sense and good will. I refer to the roadstone quarrying industry.

Unfortunately, the future outlook is marred by a development of quarrying by local authorities, some of whom not only illegally sell their stone to other authorities, but pay wages at less than the rate fixed by the Whitley Council and recognized as standard for the district.

The result is that other traders are faced with the choice of losing contracts or paying sweated wages themselves, and on the men's side there is an equally unenviable choice of action.

Sir Cooper Rawson, M.P., has tried, without success, on several occasions to obtain the Government's backing for the authority of a unanimous Whitley Council in regard to a particularly flagrant case of municipal quarrying and trading. Surely something will be done when Parliament reassembles? Municipal trading is disliked by most Conservatives as such, but when it is combined with the payment of sweated wages, Socialists also condemn it.

The ironical part of it all is that quarry owners, managers and men who are ratepayers are, in some districts, actually subsidizing their competitors, for rates have been used to finance quarries and to enable them to undersell private enterprise.

Yours, etc.,
G. R. HALL CAINE.

News of All the Industry

Incorporations

Castone Fireplace Mfg. Co., 2614 John R. St., Detroit, Mich., $10,000.
Bode Concrete Co., Portland, Ore., $5,000. H. W. Bode, C. W. Michael and J. G. Arnold.
Liberty Marble and Granite Co., Spartansburg, S. C., $10,000. J. R. Jordan, 146 S. Liberty St., and others.
Clancy Sand and Gravel Co., Inc., Flushing, N. Y., $2,000. William A. Clancy, Charles J. Clancy, Frank J. Clancy.
Peerless Sand Co., Dover, Del., $200,000. W. I. N. Lofland, William Virdin, Mark W. Cole. (Capital Trust Co. of Delaware.)
Lime Products Co., Fordyce, Ark., increased capital stock from $48,000 to $400,000. A. B. Banks is president and Van M. Howell, secretary-treasurer.
Muscle Shoals Cement Products Corp., Sheffield, Ala., $25,000. W. J. Runyon, O. P. Green. To manufacture cement bricks, ornamental trimmings, etc.
Harriman Brothers & Co., Inc., Hammond, Ind., $18,000; cement and cement products. Directors: Sam L. Bayliss, Joseph J. Million, Gordon F. Harriman, Newell J. Harriman.
Platte River Sand and Gravel Co., Omaha, Neb., $250,000, divided into 2500 shares of $100 each. John A. Kuhn, William J. Hynes, Frank B. Johnson, H. J. Albers and Joseph P. O'Keefe. (Filed by Attorneys Smith, Schall, Howell & Sheehan.)

Quarries

Franklin Canyon Granite Co. has engaged in business in Franklin Canyon, near Los Angeles, Calif., under the management of W. P. Cunningham of Beverly Hills, Calif.
Oregon Granite Co., Roseberg, Ore., will open a branch plant at Medford, Ore.
Atlas Rock Co., 300 S. W. North River Drive, Miami, Fla., has let the contract for a $35,000 storage plant at 75 N. W. 14th St.
Minnesota Granite Co., located on Kimball Rd., St. Cloud, Minn., had its plant damaged by fire recently with a loss of about $4,000.
Hauser Construction Co., Long Beach, Calif., has already placed a total of 15,683 carloads, or about 752,785 tons, of rock, it is reported, in the three harbor structures it is building for the city in the Long Beach outer harbor development. Work is being concentrated at present upon the breakwater, a structure which when completed will contain 1,211,000 tons of rock. The Hauser company will also construct the moles and bulkheads.
Bethany Crushed Stone Co., Bethany, Mo., was halted in its preparations to resume operations in its quarry when during the recent floods the pit was filled with water. Pumps were placed in operation to remove the water. The machinery under water was not damaged seriously, it is reported.
Consolidated Rock Products Co., Brooksville, Fla., is reported to have started production a few weeks ago at their new plant. The plant has a daily capacity of 2000 tons and represents an investment of $500,000.
Lewiston, Wash.—The extensive marble deposits owned by W. H. Reed here are reported to have just been purchased by a syndicate of local business men. The deposits of white, black and variegated marble are located in Asotin county, 25 miles south of Asotin, where the Grand Ronde river flows into the Snake. Marble palisades line the river's edge. The marble takes a high polish, and millions of tons, it is said, lie unused for lack of rail transportation.
Michigan Limestone and Chemical Co., Rogers City, Mich., has let the contract for construction of a two-story and basement 175x250-ft. factory building.

Sand and Gravel

Tower & Hakanson, Gold Beach, Ore., is reported to be building bunkers for a gravel crushing plant. The gravel is to be taken from a bar in the Rogue river, it is said, and spread over the Roosevelt Highway between Euchre Creek and Wedderburn.
Koch Sand and Gravel Co., Evansville, Ind., sent a fleet to Mt. Vernon, Ind., recently, filling the company's yard in that city with sand and gravel to supply the trade during the winter months. A large supply is being laid in. The past season has been a good one for the sand and gravel companies at Evansville and other towns in southern Indiana.
Ball-Newark Gravel Co., which has a plant in the course of construction at Newark, Ark., recently installed an Erie shovel for the purpose of getting out bank-run road material.
North Pacific Construction Co., 723 Detwiler Bldg., Los Angeles, Calif., has begun the construction of a 16x60-ft. sand and gravel bunker at 4812 Wilshire Blvd.
Ross Island Sand and Gravel Co., Portland, Ore., has taken out a permit to construct a hopper and tramway at the west side of Hardtack island which will cost $15,000. The Baker Construction Co. has the contract.
William Grayson, who is having a new gravel plant erected at Delight, Ark., hopes to have the plant in operation, it is reported, by the first of the year or even sooner. When completed the plant will have a capacity of 15 cars a day, and it is being constructed in such a way that additional machinery can be put in to increase the output when necessary.
Platte River Sand and Gravel Co., recently incorporated at Omaha, Nebr., will conduct operations in Nebraska and western Iowa. Headquarters will be located in Omaha.
Enwood Sand and Rock Co., located just east of Roseville, Calif., will at once install a new rock crushing and gravel plant on the lower end of its holdings. The material at the present location runs about 80% sand, and as the demand for rock is now strong they will put in this new plant where the material runs 80% rock, thus giving them about an even output when both plants are running, and a chance to exactly proportion the supply to the demand.
Union Rock Co., 656 S. Los Angeles St., Los Angeles, Calif., has begun the erection of a $10,000 gravel bunker at 2000 W. Slauson Ave. The contract was awarded to Houghton & Anderson.

Gypsum

Canadian Gypsum Co., Montreal, Can., announce the purchase of three four-wheel tank locomotives from the Montreal Locomotive works of the American Locomotive Co. These locomotives will have 10x16-in. cylinders and a total weight, in working order, of 39,000 lb.
Antigonish, Nova Scotia. Options have been taken on 13 farms at Lanark, Antigonish Harbor Board, and vicinity, it is reported, by Harry McCurdy, Sydney, who it is believed has interested United States capital in the development of the large gypsum deposits of these properties. The options have some months to run, however, so that at the present time it is impossible to say if the expected development will ever take place.
Standard Gypsum Co., San Francisco, Calif., is reported to be making negotiations to add another vessel to its fleet now carrying gypsum from Mexico to ports at Long Beach and Seattle. The report is said to have emanated from the company's steamer S. A. Perkins, which dropped 6000 tons of raw gypsum at Long Beach, going on with the balance of 8000 tons to Seattle recently.

Lime

Comax Limestone and Fertilizer Co., Ltd., has just been organized at Courtenay, B. C., with a capital stock of $10,000, divided into 200 shares of $50 each, according to reports. R. U. Hurford was elected president and E. R. Bewell, secretary-treasurer, with A. Smith, Williamson, Hurford, Morrison, and W. A. B. Paul as directors. A crusher, bagger and unloading machinery have already been ordered to start operations, it is said.
Limeton Lime Co., Front Royal, Va., whose plant, located at Karo, Va., was destroyed by fire in April, report that they have put up a much more modern plant in its place, at which operations were started August 1. Additional storage space for hydrate lime was provided, Mr. R. E. Herr, president and treasurer, advises, in order to take care of orders more promptly during rush seasons.
Gibsonburg Lime Products Co., Gibsonburg, O., has awarded a general contract, it is said, to the Bellefontaine Steel Co., Bellefontaine, O., for the new plant, to cost $175,000 with equipment. L. W. Zorn is head.
Black Marble and Lime Co., Enterprise, Ore., is reported to have started work on laying the concrete foundations for the kilns of its new plant at Enterprise, Ore. Work also is being done on the loading towers and terminals for the tram line from the quarry to the plant. Actual construction of the largest kiln will begin immediately. Complete equipment for two kilns has already been shipped the company and it is planned on having both of them in operation this fall. There will be four kilns in the completed plant.
Mohawk Limestone Products Co., Jordanville, N. Y., has recently added a No. 3 Clyde lime hydrator and weighing hopper and scale to its equipment.

Cement

John W. Sheehan, Lynn., Mass., was awarded the contract for furnishing cement for the next 12 months to Lynn city departments, according to a newspaper report. Since the city has quite an extensive roadbuilding program scheduled, it is thought that approximately 10,000 bbl. of cement will be used.
Virginia Portland Cement Corp., South Norfolk, Va., recently played host to the Norfolk Lions Club, entertaining the members at luncheon and taking them through the plant on a tour of inspection. This is the third local civic club the company has entertained. Rotarians and Kiwanians enjoyed the hospitality several years ago.
Phoenix Portland Cement, Inc., expect to start operations, it is reported, at their new, modern, wet-process portland cement works within the next three months. Lindley C. Morton is president of the company. The plant will represent an investment of around $2,000,000 when completed.
Lehigh Portland Cement Co., Allentown, Penn., has let the contract for additions and alterations to its plant in Mason City, Iowa, to cost $200,000.
Commercial Cement Co., Babcock, Man., Canada, may be reorganized as a result of a thorough investigation and recommendation by the Industrial Development Board of Manitoba.
Cumberland Portland Cement Co., Cowan, Tenn., was visited recently by 65 business men of Nashville and nearby cities, who made the trip in a special car. An inspection of the plant was made under direction of Ralph T. Miller, chemist and engineer in charge of construction and operation. Later a barbecue was enjoyed with W. V. Davidson, president of the new company, acting as host.
Florida Portland Cement Co., Tampa, Fla., has placed a crew of workmen on a recently acquired 40-acre clay deposit near Brookville, Fla., fencing and clearing it preparatory to beginning of production when its $5,000,000 plant in Tampa is completed. A 600-acre limestone deposit, also near Brooksville and purchased recently, will be stripped later.

Cement Products

Consolidated Concrete Corp., Tampa, Fla., plans building a new plant on Nebraska Ave. Heights, according to R. C. Lafferty, president. The plant will have a 214-ft. frontage on the Seaboard Air Line R. R. Its manufacturing capacity will be 7000 concrete blocks and 20,000 concrete tile daily. The company will move its present plant to the new site and will also install additional machinery.
Joe Lunardelli has engaged in business at 1218 Le Conte Ave., San Francisco, Calif., under the name of Santa Rosa Concrete Co.
Erie Cement Products and Supply Co., Toledo, Ohio, according to reports, has had a suit filed against them in common pleas court by the Besser Manufacturing Co. of Alpena, Mich., asking for the appointment of a receiver. The suit also asks judgment of $8,373.08 from Elias Fellabaum, head of the cement company, which amount is claimed due on notes, it is stated.

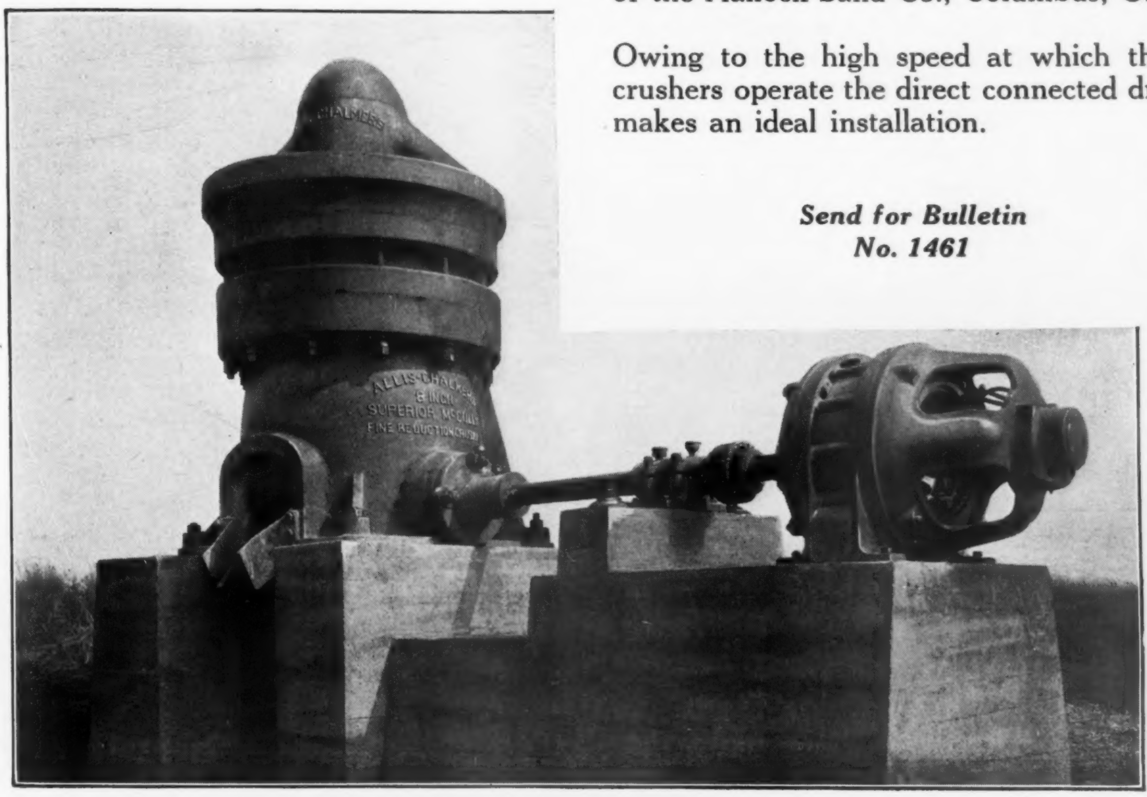
Superior McCully Fine Reduction Gyratory Crusher

The most successful secondary gyratory crusher on the market today

Allis-Chalmers 6" Superior McCully Fine Reduction Gyratory Crusher direct connected to an Allis-Chalmers 50 H. P. Type ANY slip ring motor at 600 R. P. M. installed in the plant of the Hallock Sand Co., Columbus, Ohio.

Owing to the high speed at which these crushers operate the direct connected drive makes an ideal installation.

Send for Bulletin No. 1461



SIZES, CAPACITIES, HORSE POWER AND WEIGHTS

Size of Crusher in Inches	Two Feed Openings, Size Each in Inches	Capacity Per Hour in Tons of 2,000 Pounds — Size of Discharge Opening in Inches												Driving Pulley		H.P. Required	Weight of Crusher in Pounds
		¾	⅞	1	1¼	1½	1¾	2	2¼	2½	3	3½	4	Size in Inches	R.P.M.		
6	6x40	24	28	32	40	48								36x12½	500	40 50	32,000
10	10x52					80	94	107	120	135				36x18½	450	75 100	64,000
18	18x68									250	300	350	400	44x25	400	200 250	182,000

ALLIS-CHALMERS

MILWAUKEE, WIS. U. S. A.

Silica Sand

Gem Stone Silica Co., recently organized, according to reports at Oroville, Wash., to quarry, crush and prepare silica and other stones at a plant to be erected there, announces the election of the following as trustees for the first six months: R. D. Simpson, J. M. Adams, Len Eisele, C. W. Smith and A. L. Kitching. The trustees, in turn, elected the following men to hold office for the first six months: R. D. Simpson, treasurer and credit man; J. M. Adams, secretary and legal advisor; C. W. Smith, president; Len Eisele, vice president. The initial cost of the plant, it is said, and the material to be used in the quarries will be approximately $15,000.

Rock Phosphate

San Francisco Chemical Co., Montpelier, Ida., is opening a new tunnel on its phosphate deposits on the north side of Montpelier Canyon. They are doing much new development work, it is said, on this particular site. The work is under the supervision of Manager Joseph Taylor.

Miscellaneous Rock Products

Federal Fluorspar Co., 312 S. Sixth St., Louisville, Ky., are planning on developing about 200 acres of fluorspar properties, to include the installation of a grinder mill, power house, air compressors and auxiliaries. It is estimated that the entire plant will cost approximately $60,000.

Portland-Monson Slate Co., Portland, Me., recently suffered a loss of $30,000 when its plant here was destroyed by fire. Machinery and stock in the plant were nearly a total loss, it is said.

Asbestos Shingle, Slate and Sheathing Co., Ambler, Penn., is now building its $100,000 branch plant just north of St. Louis, Mo. The announcement of the purchase of the St. Louis property by the Asbestos company was made in the June 26 issue of ROCK PRODUCTS.

A. P. Lundin, 100 N. Parsons St., New York, N. Y., and associates are reported to have leased 12,000 acres of land in Sutton county, Texas, near Sonora, to develop potash deposits thereon.

Personals

E. H. Aigeltinger, formerly connected with the Felix Gross Co. of San Francisco, Calif., has accepted the position of sales manager of the Eclipse Lime and Cement Co. of that city.

S. W. Galhuly, field representative of the Indiana Limestone Co., Kansas City, Mo., has moved from 716 Pioneer Trust Bldg. to 301 Security Bldg.

Obituaries

Otto Thomsen, 42, president of the Bettendorf Stone Co., which operates the Cady quarry in Moline, Ill., died in a Moline hospital October 22 following a brief illness. Mr. Thomsen was a prominent Mason, holding membership in Trinity Lodge of Masons, No. 208, and in Zarapath consistory. He was born in Davenport, Iowa, on June 21, 1884. Surviving him are the widow, Mrs. Louise Wind Thomsen, one daughter, Dorothy, both of Moline, residing at 1306 Thirteenth St.; his mother, Mrs. M. Thomsen, and one brother and one sister, all of Davenport.

Bruce W. Maxwell, 59 years old, vice president and general manager of the Maxwell Gravel Co. of Indianapolis, Ind., and a resident of that city more than fifty years, died October 27 at the Methodist Hospital in his home city. Mr. Maxwell had been ill only four days. Death resulted from blood poisoning caused by a slight injury to his hand some time prior.

John Rodanberry, 38 years old, a fireman for the Marquette Cement Co., Cape Girardeau, Mo., was burned so badly October 28 in an explosion of coal dust that he succumbed within a short time.

Charles G. Chisholm, managing head of the Haynes Stellite Co., New York, N. Y., died Thursday, October 21, at Kokomo, Ind., after a week's illness. Death resulted from acute inflammation of the liver. Mr. Chisholm's business career started with the Southern Pacific railroad and in 1915 he resigned his position of general passenger agent at Seattle to form the Union Carbide Co. When the Hayes Stellite Co. was acquired by the Union Carbide and Carbon Corp. in 1920 Mr. Chisholm became its general sales manager. In 1925 he was made general manager of this company, in which position he continued until his death.

Manufacturers

Mundy Sales Corp., New York, N. Y., announces that the George B. Curd Equipment Co., 609 Reading Rd., Cincinnati, Ohio, with James D. Hughes as sales manager, has been appointed the exclusive distributor for Mundy equipment n southern Ohio, with exception of a few counties.

Allen Cone Co., El Paso, Tex., has been sold to a New York company of which E. S. Tompkins is president. The company will not only manufacture and sell the Allen cone, but will specialize in problems of classification, thickening, and dewatering.

Allis-Chalmers Mfg. Co., Milwaukee, Wis., announces the appointment of Ernest Smith as sales engineer in the Oruro, Bolivia, office. This is a branch of the company's district office at Santiago, Chile.

Rollway Bearing Co., Inc., Syracuse, N. Y., announce the appointment of John Parker as New England representative.

Detroit Stoker Co. will have a display of full size underfeed stockers at the New York Power show.

Diamond Power Specialty Corp. will exhibit a miniature boiler and a motion picture film illustrating the advantages of soot blowers on oil-fired boilers at the New York Power show.

Heltzel Steel Form and Iron Co., Warren, Ohio, have begun work on a new addition to their factory. Modern equipment for the manufacture of steel bins, etc., will be installed upon completion.

Allis-Chalmers Mfg. Co., Milwaukee, Wis., is opening a branch office in Jackson, Mich., with L. F. Berry as resident representative. This office, located at 512 Reynolds Bldg., Jackson, is a branch of the company's office in Detroit, which is under the direction of F. S. Schuyler as district manager.

Trade Literature

NOTICE—Any publication mentioned under this heading will be sent free unless otherwise noted, to readers, on request to the firm issuing the publication. When writing for any of the items kindly mention ROCK PRODUCTS.

Perforated Screens. Bulletin **No. 55** on perforated metal screen plates for sizing and grading sand, gravel, stone, etc. Illustrations and data on perforation designs. MORROW MFG. CO., Wellston, Ohio.

Corduroy Cranes. Bulletin No. **42X** describing and illustrating P & H corduroy cranes operating on gas or electric power, using buckets from ½ to 1¾-yd. capacity for handling rock, sand and gravel, slag, etc. Dimensions and capacities and other data. HARNISCHFEGER CORP., Milwaukee, Wis.

Excavation Equipment. Bulletin No. **61X** illustrating and describing complete line of P & H shovels, draglines, cranes, etc. Construction details, data on design, dimensions and capacities. HARNISCHFEGER CORP., Milwaukee, Wis.

Gears. Catalog No. **200** describing and illustrating industrial gears of every form. Engineering information, tables and construction data. FOOTE BROS. GEAR AND MACHINE CO., Chicago, Ill.

General Electric Bulletins. GEA-484 on control equipment for charging storage batteries; **GEA-517** on type CD, totally enclosed fan-cooled d.c. motor. GENERAL ELECTRIC CO., Schenectady, N. Y.

Electric Recorders. Bulletin on single, duplex, multiple and multiple-duplex electric recorders for use with flow meters, pyrometers, pressure gauges, etc. BROWN INSTRUMENT CO., Philadelphia, Penn.

Osgood Shovel. Bulletin No. **2620** illustrating and describing Osgood 1-yd. gas or electric shovels. Specifications, capacities, working ranges, etc. THE OSGOOD CO., Marion, Ohio.

Orton Shovel. Bulletin No. **42** on the new model "V," ½-yd. gasoline shovel. Dimensions, general specifications and data on designs. ORTON CRANE AND SHOVEL CO., Chicago, Ill.

Speed Reducers. Catalog No. **100** on the IXL continuous tooth herringbone speed reducers manufactured by FOOTE BROS. GEAR AND MACHINE CO., Chicago.

Future of Federal Aid Highways

W. M. JARDINE, Secretary of Agriculture, gave an interesting address to the American Association of Highway Officials at Pinehurst, N. J., November 9. In it he reviewed the progress of highway construction in the United States and gave some idea of what, in his opinion, the future of our highway development would be.

Since 1916, Mr. Jardin pointed out that the number of motor vehicles in the United States has doubled and twice redoubled. Only a small percentage of the surfaced roads of that period would be regarded today as fit for motor vehicle traffic. Today the mileage of surfaced roads is at least twice what it was in 1916 and more than 100,000 miles are improved with a surface more satisfactory than the waterbound macadam then in use. There were only 5 states in which there were transstate highways then, while now there are 25 states which have at least one transstate road. Highway departments were maintained in 16 states then and are maintained in every state in the Union now.

Of the Federal aid policy, Mr. Jardine rightly said that the 50,000 miles of road which have been improved under it are of less significance than the principles upon which the policy is founded and which are thus given nation-wide importance.

As to the future, Mr. Jardine said that he was impressed with the necessity of making adequate provision for the increasing service that will be expected of the highways. There is no reason to believe that the increase in motor vehicles will be abruptly halted now, although the rate of increase may fall off. We must expect the conditions we have today to be intensified and we must build our highways to be capable of expansion to meet the needs of growing traffic as these mature.

Mr. Jardine then spoke of how the problems of the future presented themselves to different groups of highway officials, those to whom the problem was to get the traffic through at all and those more fortunate ones whose immediate concern is the selective betterment of a system to relieve congestion and eliminate danger. But all, he said, while serving present needs, should bear in mind the great needs of the future. This is the policy of stage construction, a policy which recognizes the impossibility of building once and for all a finished system of highways and substitutes the principle of progressive improvement.

The latter part of the address was given to a consideration of the great highways across the continent, and it was pointed out that finishing these is only a matter of closing gaps, which will probably be done by 1930. One possible route totaling 3133 miles has only 95 miles of unimproved road; 2907 miles are surfaced and 131 miles drained and graded. Other routes are improved from 63% to 97%. There are approximately 80,000 miles of road in these routes.